

Evaluation of Survival Time of Tooth Color Dental Materials in Primary Anterior Teeth

Behjat-Al-Molook Ajami¹, Masoumeh Ebrahimi¹, Abbas Makarem¹, Taraneh Movahhed¹, Amir Reza Motamedi²

¹ Dental Material Research Center, Department of Pediatric Dentistry, Faculty of Dentistry, Mashhad University of Medical Sciences, Mashhad, Iran

² Dentist, Mashhad, Iran

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Abstract

Introduction: In restorative dentistry, selecting the proper material is an important factor for clinical success. The objective of this study was clinical evaluation of survival time of three tooth color materials in primary anterior teeth. **Methods:** In this interventional clinical trial study, 94 deciduous anterior teeth (36 teeth in boys, 58 teeth in girls) belonging to 3-5 year old children in Pediatric Department of Mashhad Faculty of Dentistry, Iran were selected. Selective dental materials included compoglass, glass-ionomer Fuji II LC, and composite resin. The data were analyzed with Kaplan-Meyer and Log rank test. **Results:** compoglass had the highest survival time in comparison with composite and glass-ionomer. Nine months retention rate for teeth restored with compoglass, composite resin and glass-ionomer were estimated: 95%, 21%, and 12.5%, respectively. **Conclusion:** Compoglass can be a suitable material for anterior primary teeth restoration.

Key Words: Dental restoration, primary teeth, survival time.

Introduction

These days, most of the parents are worried about aesthetics in pediatric dentistry. Having complained about anterior teeth caries in spite of different carries in posterior teeth, parents are getting more concerned. Moreover, the health of anterior primary teeth is an important psychological issue for kindergarten children due to their close contact with each other. Using the resin-based composite and glass-ionomer have increased, because of the parent's interest in aesthetic (1).

Unlike the adult patients, the child patients have less cooperation and they are usually restless and stressful during treatment. To succeed in treatment, the dentist should use different controlling techniques. As a result, most of the dentists' attention is not only applied to control the patient but to do the dental treatment more quickly as soon as possible. To do the procedure more successfully the filling materials should need the least cavity preparation, be easily applicable with a specific adhesion to dental structure and without being easily separated. Plus, these filling materials, must not only have enough strength and wear resistance but not be sensitive to moisture as well (2). In this current technology-driven climate, the filling material, are improving which, among them composite resins and polyacid-modified composite resins (compomers) are the common materials (3).

The dental materials survival time depends on the materials, the operator and the patient. The variety of the restoration area in mouth, and the different hygienic condition (such as, caries risk status and frequency of fluoride therapy) of the patients causes invalid comparison of the different studies (4). The studies show that the composite resins have been the best filling

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material of silicates and acrylic restorative resins due to excellent mechanical features, lower thermal coefficient of expansion and more wear resistance. Because of their adhesive properties, the glass-ionomer cements have been used as a good substitute to composite resin; however, due to the sensitivity to moisture and low mechanical features, the compomers have been introduced (5).

The compomers are resin composites that their filler is the same as glass-ionomer. The dehydrated polyalkenoic acid is a part of the compomers that react with the filler in presence of water (5,6). The objective of this study was evaluation of survival time of tooth – color materials in primary anterior teeth restoration.

Materials and Methods

In this interventional clinical trial study, 94 deciduous anterior teeth (36 teeth in boys, 58 teeth in girls) in 3-5 year old children in Pediatric Department of Mashhad Faculty of Dentistry were selected. They had class III, IV, V caries in their upper anterior teeth. Dental treatment carried out just for children with informed consent.

Selective dental materials included compoglass (Vivadent, Schaan, Liechtenstein), glass-ionomer Fuji II LC (GC Corporation, Tokyo, Japan) and composite resin (Degufill). Materials were used according to manufacturers' instructions. Children with moderate class III, IV, V caries were selected. After behavior management of children in first appointment, cavity preparation and restoration were done in the second appointment by one dentist. Rounded-end high speed carbide burs (No. 330) were used for cavity preparation. Both of the central and lateral incisors in one side were restored with one dental material, and another side was restored with another dental material. In cases with need for pulpectomy, it was done prior to restoration. The restorations followed after 1, 6 and 9 months. The data were analyzed with Kaplan–Meyer and Log rank test.

Results

The observation time for three types of tooth colored dental material ranged from less than 1 month to 9 months. The average survival time of all 94 teeth

colored restorations was 5.5 months with a standard error of 0.3 months. Distributions of study groups according to study variables, such as type of dental material, type of restoration, type of tooth, type of treatment (treatment with or without pulp therapy) and age of children were shown in Table 1.

Compoglass, composite resin and glass-ionomer had 95%, 21% and 12.5% survival rate after 9 months, respectively (Table 2). The results showed that compoglass had a significantly higher survival probability (log rank test, $P < 0.001$) compared with composite and glass-ionomer (Fig. 1). The Kaplan–Meyer survival time curves indicated that class of restorations had a significant influence (log rank test, $P = 0.01$) (Fig. 2), and the survival probability of the class V restorations was greatest in the case of a tooth colored restoration. The cross tabulation of class of dental caries and survival time of tooth colored dental materials was shown in Table 3.

In contrast, there were no statistically significant differences between the types of treatment (with or without pulp therapy) with regard to survival time (log rank test $P = 0.5$) (Fig. 3); however, only a tendency for a higher survival probability evident with dental treatment without pulp therapy. Analysis of the survival time curves of the three types of tooth colored dental material based on different anterior teeth ascertained no statistically significant differences (log rank test $P = 0.9$) between four types of maxillary anterior teeth (Fig. 4). The Kaplan–Meyer survival time curves of the three type of tooth colored dental material were shown in relation to the age of study children (Fig. 5). No statistically significant differences (log rank test, $P = 0.12$) were ascertained between different ages.

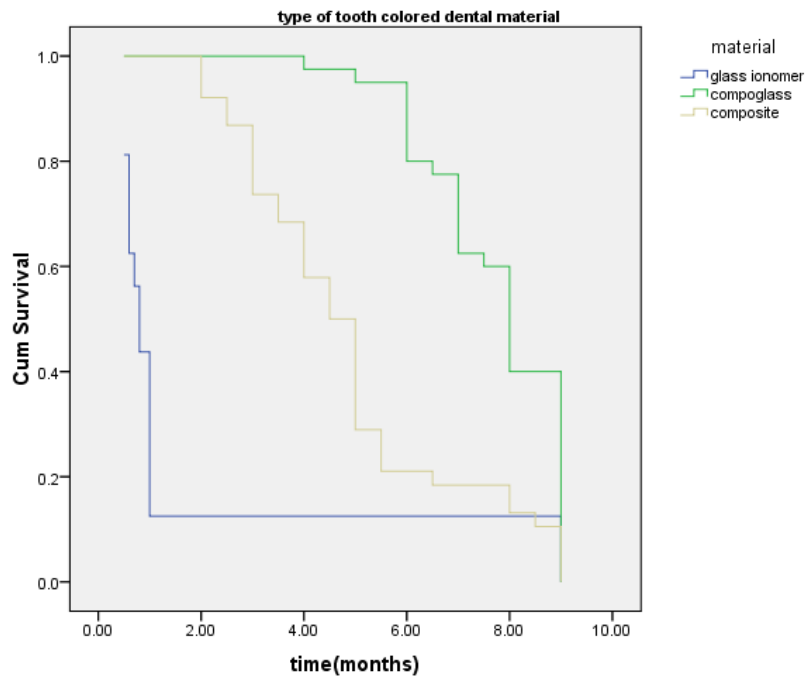


Figure 1. Kaplan–Meyer survival curve for three types of tooth colored dental material (N = 94)

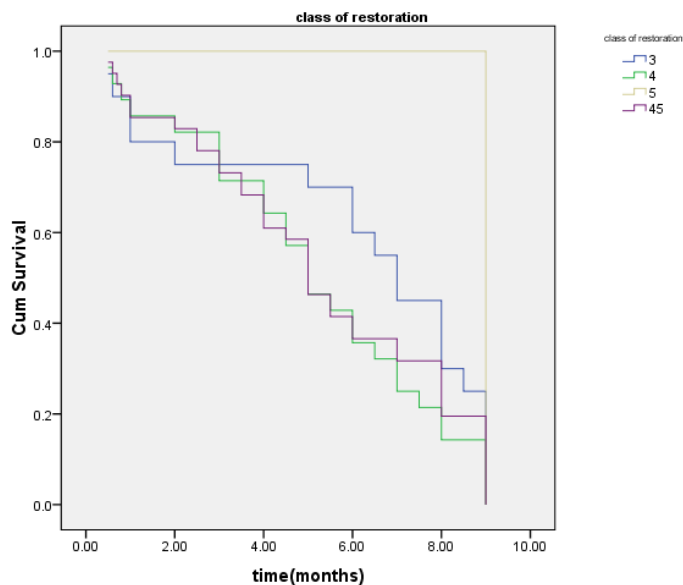


Figure 2. Kaplan–Meyer survival curves for the three types of tooth colored dental material, subdivided according to the class of restoration

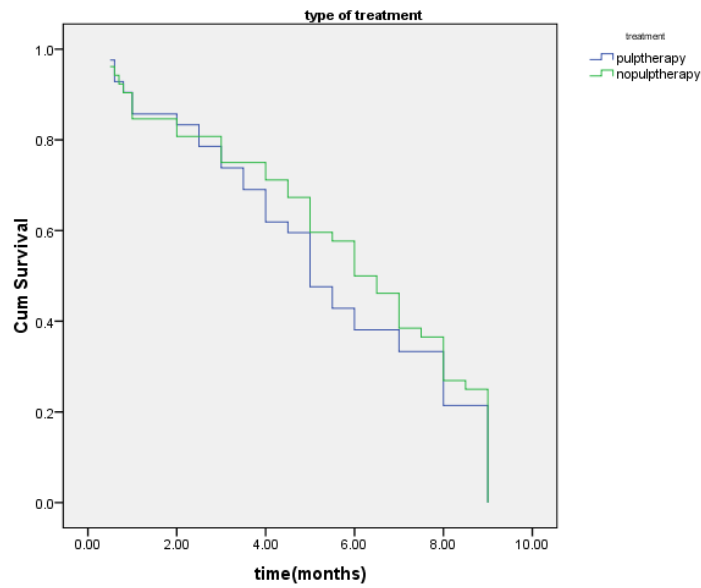


Figure 3. Kaplan–Meyer survival curves for the three types of tooth colored dental material, subdivided according to the type of dental treatment

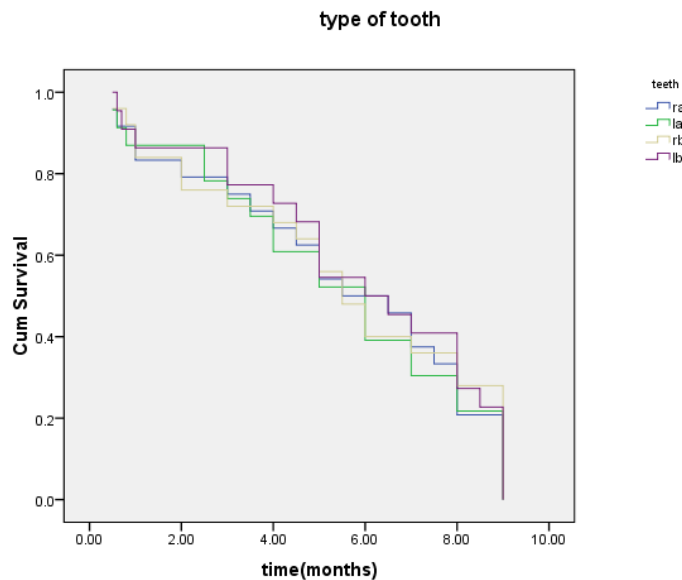


Figure 4. Kaplan–Meyer survival curves for the three types of tooth colored dental material, subdivided according to the type of tooth. RA: Right maxillary central incisor, RB: Right maxillary lateral incisor, LA: Left maxillary central incisor, LB: Left maxillary lateral incisor

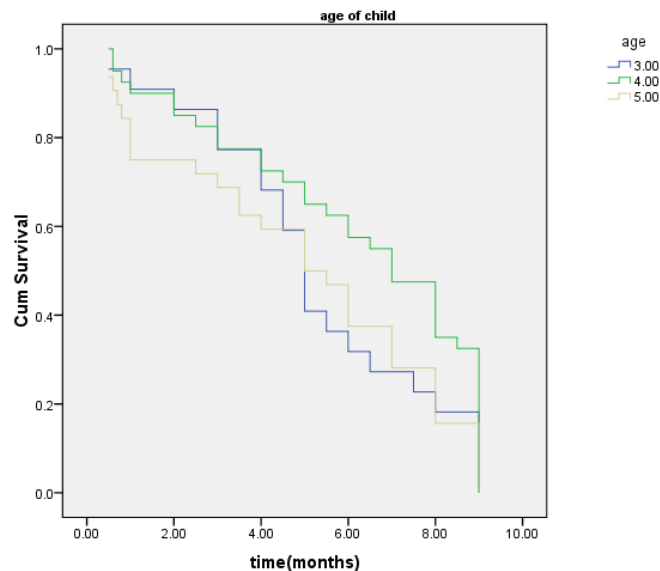


Figure 5. Kaplan–Meyer survival curves for the three types of tooth colored dental material, subdivided according to the age of children

Table 1. Frequency distribution of study groups with regard study variables in percent

Variables	Frequency of variable (%)
Type of dental material	
Glass-ionomer	17
Compoglass	42.6
Composite	40.4
Age	
3	23.4
4	42.6
5	34
Type of tooth	
RA	25.5
RB	26.6
LA	24.5
LB	23.4
Type of restoration	
Class 5	5.3
Class 4	29.8
Class 3	21.3
Class 4&5	43.6
Type of treatment	
With pulp therapy	44.7
Without pulp therapy	55.3

Table 2. Frequency distribution of study groups according to survival time and type of material

Type of material	Glass-ionomer %	Compoglass %	Composite %
Survival time			
1 month and less	87.5	100	100
1 to 6 month	87.5	95	78.9
6 to 9 month	12.5	95	21

Table 3. Class of dental caries by survival time of tooth colored dental materials

Class of dental caries		Survival time			Total
		Time<1 Month	1≤Time≤6	Time>6	
3	Count	2	6	12	20
	of total teeth %	2.1	6.3	12.7	21.1
4	Count	3	15	10	28
	%	3.1	15.9	10.6	29.7
5	Count	0	0	5	5
	%	0	0	5.3	5.3
4&5	Count	4	22	15	41
	%	4.2	23.4	15.9	43.6
Total	Count	9	43	42	94
	%	9.5	45.7	44.6	100%

Discussion

There were limited studies in the literature on clinical evaluation of tooth-color dental materials in the primary anterior teeth. Grewal and Seth's study (7) showed that there was respectively 1.42%, 8.19% failure rate after 6 and 9 months in composite restoration of primary anterior teeth. The retention rate of composite restorations was more than our study.

In according to our study, the greatest survival time was seen in compoglass. These restorative materials have the chemical and mechanical features of resin composites and glass-ionomer cements. These materials have very prominent qualities which make them different from others. These characteristics are easy to apply, adhesion to dental structure, fluoride release, increased physical and mechanical qualities, biocompatibility and easy finishing. However wear and

weak abrasion resistance of this material have been reported (6).

The compomers have the best handling and its consistency lets the dentist to use it easily, so they can be polished in less time. The esthetic, no mixing, light polymerization and prominent physical strength are their advantages in pediatric dentistry (8). Despite being the newest class of materials it was reported more than 90% successes in restoration of primary molars after 3 years. As a result, it is one of the best choices for many patients (9).

In this study, the survival time in teeth which are restored by composite resin was low (21% for 9 months). The following reasons can be main factors in low success rate of composite resin in anterior primary teeth restoration in our study. The enamel in primary teeth is not only thinner than the permanent teeth but it

has less mineral content. In comparison with permanent teeth the pores in primary teeth are 10 times more. For prismless layer, the composite restoration is not commonly accepted in deciduous teeth (9).

In long term clinical achievements, we should overcome the undesirable qualities to resin composite. One of the weak points in resin composite is the volumetric shrinkage during polymerization which causes 4-7 Mpa contraction forces resulting to breaking the enamel margins. This forces lead to forming gap between the resin composite and the cavity preparation walls with poor bonds. Microleakage, sensitivity, margin restoration staining and recurrent caries are originated from marginal gap (10). Despite excellent advantages of composite resin, they have some poor adhesion to dental structure and polymerization shrinkage (11).

In our study, glass-ionomer had the lowest retention rate among compomer and composite resin. Its low survival time is related to moisture sensitivity and low mechanical qualities (5).

Considering the mechanical properties (tensile, flexural, wear resistance), the compomers are believed to be better than glass-ionomer but affect less than resin composite. Both resin modified glass-ionomer and conventional glass-ionomer has similar indications and they have poor to abrasion (9).

Several successful studies such as using the modified omega wire extension (12), biological restorations (7), polyethylen ribbon fibers (13), bonded resin composite strip crowns (14-16), anterior veneered primary stainless steel crowns (17), fiber core posts (18,19), resin faced stainless steel crowns (20), suggested for treatment of severely damaged anterior primary teeth in recent years.

Conclusion

In according to high survival time for compoglass comparison with composite resin and glass-ionomer in present study, it can be a suitable material for anterior primary teeth restoration.

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Corresponding Author:

Masoumeh Ebrahimi
Dental Material Research Center
Mashhad University of Medical Sciences, Mashhad, Iran
P.O. Box: 91735-984
Tel: +98-511-8829501
Fax: +98-511-8829500
Email: Ebrahimima@mums.ac.ir

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