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Clinical and Radiological Performance of High-viscosity Glass Lonomer Cement and Compomer in Class II Restorations in Primary Molar Teeth

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Abstract

The present study aimed to evaluate clinical and radiographical success of high viscosity glass ionomer cement and compomer in primary molar teeth for 12 months. High viscosity glass ionomer cement Equia Fil (GC Corporation, Tokyo, Japan) and compomer Dyract XP (Dentsply De Trey, Konstanz, Germany) restorations were placed in 30 children between the ages of 4 and 9 with symmetrical proximal surface caries in primary molars. Restorations were evaluated clinically according to the modified United States Public Health Service (USPHS) criteria at the 1-week, 3-month, 6-month, 12-month recall and radiographically at 6 and 12 months. When the restorations are evaluated in terms of marginal discoloration, marginal adaptation, postoperative sensitivity, secondary caries, anatomical form and radiographic findings, no statistically significant difference was observed between two groups. There was a statistically significant difference between the groups for the retention, color match and surface texture scores at 12 months. It has been concluded that retention, surface texture and color match results of Equia Fil showed less successful at the end of 12 months. Therefore, selection of samples with small cavities for Equia Fil can increase the success rate of the restoration. Further research is required to confirm the results.

1. Introduction

Caries management in children is important in terms of nutrition of the child, provision of esthetic and speech function, protection of the arch dimensions and guidance to the permanent teeth that will follow. Along with many materials used for the restoration of primary teeth, the search for alternative materials is still ongoing (Gurgan, Kutuk, Yalcin, Cakir, & Ergin, 2020).

Compomers, which are frequently used in primary teeth restorations, have been developed to combine the mechanical properties of composites with the binding and fluoride release properties of glass ionomer cements (Nicholson, 2007). Although it is commonly used in pediatric dentistry, it is reported that during application of adhesive systems, microleakage problems are encountered as a result of polymerization shrinkage due to high technical sensitivity requirement and in its resin content (Demirci, Yıldız, & Uysal, 2008).

Glass ionomer cements, first introduced by Wilson and Kent in the early 1970s, have a wide range of use in pediatric dentistry because of their chemical adhesion and fluoride release property (Wilson, & Kent, 1972). However, these traditional glass ionomer cements are associated with some disadvantages such as delayed setting reaction, low fracture toughness, and other poor esthetics. As a result, the conventional glass ionomer cements has undergone some modifications to overcome these limitations (Shruthi et al., 2015).

High-viscosity glass-ionomer, containing fiberglass particles, anhydrous polyacrylic acid of high molecular weight and high powder-to-liquid mixing ratio has improved compressive strength and wear resistance properties and facilitated handling, advocating its use for posterior restorations (Tal, Kupietzky, Fuks, Tickotsky, & Moskovitz, 2017).

Equia Fil (GC, Tokyo, Japan) is a fast setting high-viscosity glass-ionomer cement with a nanofilled resin coat as a protective coating. The manufacturers of Equia Fil claim that the material has increased fracture toughness, flexural strength, and flexural fatigue resistance which are required in stress bearing restorations (Zoergiebel, & Ilie, 2013).

The aim of the present study was to evaluate, both clinically and radiographically, the performance of Equia Fil in proximal cavities of primary molars compared with compomer (Dyraxt XP). The null hypothesis tested was that there is no difference in the clinical and radiographic performance of the two types of restorations in primary molars over 12-month period.

2. Materials and Method

A 20-year-old The study was approved by Ankara University Faculty of Dentistry Ethics Committee on 25.02.2015 (Reference number 36290600/ 14). Informed consent was obtained from all parents/legal guardians of participating subjects to allow their information to be used in the study.

2.1. Sample selection

The children aged 4-9 years were included in the study if they had symmetrical primary molar teeth with proximal caries. Considering the technical limitations that may be encountered in the study; at

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least 32 tooth samples in each group were targeted for this study with 0.80 sensitivity, 95% confidence, and 80% theoretical power.

Inclusion criteria were as follows: proximal caries lesions in unrestored first and second primary molars that have at least 1/3 healty dentine on pulp (Extrand, Ricketts, & Kidd, 1997), requirement of at least 2 but not more than 4 molar restorations, the involved teeth were occlusally in contact, symptomless and vital, good expectation of recall availability and minimal other treatments required. As exclusion criteria, deep cavity with the possibility of containing the pulp or teeth with fistula or abscess, history of pain, pulp exposure, any periodontal problems, pathological or physiological mobility, patients with medical problems, bruxism and the absence of adjacent teeth were not included in the study.

The study was started with 30 patients who fulfill the inclusion and exclusion criteria, resulting in 76 total restorations consisted of 44 maxillar and 32 mandibular primary molars that involved 38 teeth in each group.

2.2. Treatment procedure

Informed consent was obtained from all parents of participating subjects to allow their information to be used in the study. 4-9 years aged 30 patients and 76 primary molar teeth were randomly assigned into 2 groups (determination of the groups was carried out by throwing dice) in order to restore with Equia Fil and Dyract XP Group. The materials' composition is provided in Table 1.

Restorations were performed by only one experienced pediatric dentist. Before starting the trial, the operator performed 10 restorations from each tested material on patients who were not included in the study. Before starting the restorative procedures, oral hygiene instructions were given to the patients and their families and teeth were cleaned with polishing paste. Removal of the caries was carried out with slow round burs (Komet Dental, Lemgo, Germany), and cavity preparation was performed with 023 ML diamond fissure burs (Diatech, Heerbrugg, Switzerland) under constant water cooling. When the patient complained about pain or sensitivity, local anesthesia (Ultracain forte, Sanofi, Istanbul, Turkey) was applied. Conservative cavity design was applied by following the minimally invasive dentistry principals and the preparations did not involve any cusps. Narrow isthmuses in the preparations were avoided to provide a sufficient bulk of material. Calcium hydroxide cavity liner (Life Regular Set, Kerr Corporation, Romulus, MI, USA) was applied when base material was required. Isolation and contamination control was maintained using cotton rolls and a saliva ejector. Metal matrix band (Hahnenkratt, Königsbach stein, Germany) was used with its carrier (Tofflemire, Golgran, Sao Paulo, Brazil) to control the proximal material excess.

2.3. Equia Fil group

In Equia Fil Group according to the Vita scale, suitable color for the teeth was selected. The enamel and dentin were conditioned with 20% polyacrylic acid for 20 seconds. The selected Equia Fil capsule was shaked gently and pressed the back of capsule with a finger. The capsule was placed into a metal applier and click the lever once and after this activation set into an amalgamator and mix for 10

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seconds. The mixed capsule was removed from the amalgamator, load it into the applier again and activated twice before using. Within 10 seconds, the filling was placed in the cavity and shaped. After the recommended setting time of 2.5 minutes, the matrix band was removed, the restoration was trimmed and polished wet using high-speed fine diamonds (Diatech, Swiss Dental, Heerbrugg, Switzerland). The restorations were dried gently, applied Equia Coat with an applicator to the surfaces and light-cured for 20 seconds (Flashlite 1401, Discus Dental, Culver City, Ca, America).

2.4. Dyract XP group

In Dyract XP Group, after appropriate compule color for teeth was selected, Dyract XP bonding agent (Dentsply, Konstanz, Germany) which included in its box was applied to the prepared cavity with the help of an applicator. Then polymerization was achieved with the light device (Flashlite 1401, Discus Dental, Culver City, Ca, USA) for 20 seconds. The material was applied to the cavity in sufficient quantity, and the shaping was done. The polymerization was completed with the light device for 20 seconds. Then, the matrix band was removed and again polymerized with light for 20 seconds. The occlusion control was done and restoration is finished.

2.5. Evaluation of the restorations

Clinical evaluations were performed with a mirror and an explorer under the reflector light by one experienced pediatric dentist rather than the operator. The evaluator's training was performed with the aid of restored primary teeth photographs that were representative of each score for each criterion. The subjects were evaluated for the follow up at baseline (1 week after the restoration) and 3, 6, 12 months in terms of anatomic form, colour match, marginal discoloration, marginal adaptation, secondary caries, post-operative sensitivity, surface texture and retention according to modified United States Public Health Service (USPHS) (Çelik, Arhun, & Yamanel, 2014). Restorations were scored as Alpha: Ideal clinical condition (successful), Bravo: Acceptable clinical condition (slightly faulty, but acceptable) and Charlie: Clinically unacceptable (unsuccessful) condition. Clinical photographs of the subjects were taken at all recalls for documentation. Radiographic examination that include the evaluation of presence of radiolucency in the periapical and bifurcation area (present/ not present), integrity of proximal wall (gaps present at restoration and tooth interface/ not present) and secondary caries (present/not present) was carried by taking periapical radiographs at 6 and 12 months. Radiographs were assessed by the evaluater that performed clinical evaluations before without the presence of the operator.

2.6. Statistical analysis

The collected data in this study were analyzed with SPSS version 20 (IBM, New York, NY, USA) package program.

Shapiro Wilk's was used due to the number of units when investigating the normal distribution of variables. When interpreting the results, it was stated that the variables did not come from the normal distribution if $p < 0.05$.

Differences in performance between groups over the observation time was calculated with the Mann-Whitney U test ($p < 0.05$) because the variables did not come from the normal distribution.

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To analyze the relationships between groups of nominal variables, Chi-Square analysis was applied. In cases where the expected values in the cells do not have sufficient volume in 2x2 tables, Fisher's Exact Test was used, and the Pearson Chi-Square analysis was used in RxC tables with the help of Monte Carlo Simulation.

When interpreting the results, it was stated that there was a significant relationship if $p < 0.05$.

Table 1. Composition of the materials

Material	Chemical Composition
Equia Fil	Powder: 95% strontium fluoroaluminosilicate glass, 5% polyacrylic acid Liquid: 40 % aqueous polyacrylic acid
Equia Coat	50 % methyl methacrylate, 0.09% camphorquinone
Dyract XP	Urethane dimethacrylate, Carboxylic acid modified dimethacrylate, Camphorquinone, Ethyl-4(dimethylamino) benzoate, Butylated hydroxy toluene, Strontium-alumino-sodium-fluorophosphor-silicate glass, Highly dispersed silicon dioxide, Strontium fluoride, Iron oxide pigments and titanium oxide pigments

3. Results

In this study which is started with 76 restorations (sample distribution are given in table 2), 38 ones in each group 12 drop out restorations due to moving or not willing to attend was observed at the 12- month recall. A total of 64 restorations and 24 children (24 boys and 8 girls) were included at the end of study. However, while the criteria other than retention were not evaluated for completely missing restorations; partially lost fillings were evaluated for all criteria, and the completely missing restorations were not included in the subsequent controls. Consequently, distribution of the number of restorations were evaluated according to appointments is shown in table 3 and table 4.

3.1. Clinical evaluation of restorations

At the 6-month recall, five Equia Fil restorations were completely failed and therefore other clinical evaluations were maintained with 27 restorations. At 12-month recall, 18 ones of the 27 restorations calculated as “successful” and 9 ones were failed for retention criteria. However, 3 ones of 9 failed restorations were partial missing. When partial missing restorations were added to successful ones, 21 restorations were examined at the 12-month recall. Similarly, in Dyract XP group, the completely falling restorations were not included in the study for the other evaluation criteria. At the end of the 12-month control period, a total of 29 restorations were examined.

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Table 2. Distribution of the examined teeth

Restorative Materials	Maxillary		Mandibular		Total
	Primary 1st molar	Primary 2nd molar	Primary 1st molar	Primary 2nd molar	
Equia Fil	10 OD 1 OM	11 OM	10 OD	6 OM	38
Dyract XP	11 OD	11 OM	10 OD	6 OM	38
Total	22	22	20	12	76

OD: occlusodistal, OM: occlusomesial

Table 3. Distribution of the number of teeth examined by appointments (for the retention criteria)

	Begining	1st week	3th month	6th month	12th month
Equia Fil	38	36	32	32	27
Dyract XP	38	36	32	32	31
Total	76	72	64	63	56

Table 4. Distribution of the number of teeth examined by appointments (for the other criteria)

	Begining	1st week	3th month	6th month	12th month
Equia Fil	38	36	32	27	21
Dyract XP	38	36	32	31	29
Total	76	72	64	58	50

When the retention success of the restorations is evaluated; in Equia Fil Group, 32/32 (100%) of the restorations at the 3-month recall, 27/32 (84.4%) at the 6-month recall and 18/27 (66.67%) at the 12-month recall were rated successful retention value. In Dyract XP Group, 32/32 (100%) of the restorations were recorded successfully at the 3rd month, 31/32 (96,9%) at the 6th month and 29/31 (93.55%) at the 12th month. There was a statistically significant difference among the groups only at the 12th month recall ($p<0,05$) (Table 5).

In the Equia Fil Group, although no discoloration was observed at the 3rd and 6th months, only one

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restoration had slight marginal discoloration at the 12th month. In the Dyract XP Group, no discoloration was noted 31/32 restorations (96.88%) at the 3th month, 28/31 (90.32%) at the 6th month, and 27/29 (93.1%) at the 12th month. No statistically significant difference was found between the groups in all control periods according to the marginal discoloration criteria (p>0,05).

In Equia Fil group 31/32 (96,9%), 23/27 (85,2%), 15/21 (71,4%) and in Dyract XP group 31/32 (96,9%), 28/31 (90,3%) and 24/29 (82,8%) restorations were scored as alfa for marginal adaptation after 3 months, 6 months and 12 months, respectively. There were no significant differences in the marginal adaptation scores for the tested restoration materials in all control appointments (p>0,05).

Table 5. Chi-square test result on the relationship between retention result and the groups

		Groups						**Chi-square Test**	
		Equia Fil Group		Dyract XP **Group**		**Total**			
		n	**%**	**n**	**%**	**n**	**%**	Chi-square	**p**
Retention (Begining)	**Successful**	38	100	38	100	76	100	-	-
	Acceptable clinical condition	0	0	0	0	0	0		
	Total	38	100	38	100	76	100		
Retention (1st week)	**Successful**	36	100	36	100	72	100	-	-
	Acceptable clinical condition	0	0	0	0	0	0		
	Total	36	100	36	100	72	100		
Retention (3rd month)	**Successful**	32	100	32	100	64	100	-	-
	Acceptable clinical condition	0	0	0	0	0	0		
	Total	32	100	32	100	64	100		
Retention (6th month)	**Successful**	27	84,4	31	96,9	58	90,6	Fisher's exact	0,156
	Acceptable clinical condition	5	15,6	1	3,1	6	9,4		
	Total	32	100	32	100	64	100		
Retention (12th month)	**Successful**	18	66,67	29	93,55	47	81,03	5,149	0,023
	Acceptable clinical condition	9	33,33	2	6,45	11	18,97		
	Total	27	100	31	100	58	100		

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Table 6. Chi-Square test result on the relationship between color matching results and groups

		Groups						Chi-Square Test	
		Equia Fil Group		Dyract XP Group		Total			
		n	%	n	%	n	%	Chi-Square	P
Color matching (Begining)	**Successful**	38	100	38	100	76	100	-	-
	Acceptable clinical condition	0	0	0	0	0	0		
	Unseccessful, clinically unacceptable	0	0	0	0	0	0		
	Total	38	100	38	100	76	100		
Color matching (1st week)	**Successful**	36	100	36	100	72	100	-	-
	Acceptable clinical condition	0	0	0	0	0	0		
	Unseccessful, clinically unacceptable	0	0	0	0	0	0		
	Total	36	100	36	100	72	100		
Color matching (3rd month)	**Successful**	21	65,63	32	100	53	82,81	10,978	0,001
	Acceptable clinical condition	11	34,38	0	0	11	17,19		
	Unseccessful, clinically unacceptable	0	0	0	0	0	0		
	Total	32	100	32	100	64	100		
Color matching (6th month)	**Successful**	15	55,56	31	100	46	79,31	*	0,001
	Acceptable clinical condition	11	40,74	0	0	11	18,97		
	Unseccessful, clinically unacceptable	1	3,7	0	0	1	1,72		
	Total	27	100	31	100	58	100		
Color matching (12th month)	**Successful**	10	47,62	29	100	39	78	*	0,001
	Acceptable clinical condition	10	47,62	0	0	10	20		
	Unseccessful, clinically unacceptable	1	4,76	0	0	1	2		
	Total	21	100	29	100	50	100		

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Table 7. Chi-square test result on the relationship between surface texture results and groups

		Groups						Chi-square Test	
		Equia Fil Group		Dyract XP Group		Total			
		n	%	n	%	n	%	Chi-Square	p
Surface Texture (1st week)	Succesful	32	100	32	100	64	100	-	-
	Acceptable clinical condition	0	0	0	0	0	0		
	Unseccessful, clinically unacceptable	0	0	0	0	0	0		
	Total	32	100	32	100	64	100		
Surface Texture (3rd month)	Succesful	32	100	32	100	64	100	-	-
	Acceptable clinical condition	0	0	0	0	0	0		
	Unseccessful, clinically unacceptable	0	0	0	0	0	0		
	Total	32	100	32	100	64	100		
Surface Texture (6th month)	Successful	27	100	31	100	58	100	-	-
	Acceptable clinical condition	0	0	0	0	0	0		
	Unseccessful, clinically unacceptable	0	0	0	0	0	0		
	Total	27	100	31	100	58	100		
Surface Texture (12th month)	Successful	14	66,67	29	100	43	86	Fisher's exact	**0,001**
	Acceptable clinical condition	7	33,33	0	0	7	14		
	Unseccessful, clinically unacceptable	0	0	0	0	0	0		
	Total	21	100	29	100	50	100		

When color match scores were evaluated in Equia Fil group 21/32 (65,63%), 15/27 (55,56%) and 10/21 (47,62%) restorations were scored as alfa after 3 months, 6 months and 12 months, respectively. No failure scores were monitored in any control period in Dyract XP group. A significant difference was observed between the groups for color match in all control periods ($p<0,05$) (Tablo 6).

According to surface texture results in Equia Fil group, 14/21 (66,67%) restorations showed alfa scores and 7/29 (33,33%) restorations showed bravo scores after 12 months. Dyract XP restorations

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showed no failures during the 12-month period. There was a significant difference in the surface texture scores for both materials after 12 months ($p<0,05$) (Tablo 7).

Over time, no significant change was observed in terms of anatomical form, secondary caries and postoperative sensitivity for either restorative material. In Equia Fil group, only one patient was observed postoperative sensitivity due to partial restoration loss at the end of the 12-month, whereas in the Dyract XP group, no patient complained at any control time.

3.2. Radiograhic evaluation of restorations

The radiographic findings for both groups at 6 and 12 months were included no interradicular radiolucent lesion and secondary caries. In Dyract XP group, all of the restorations were judged clinically as having good contact points and intact marginal ridges. The condensation and homogenity of the restorative material was radiographically assessed as being excellent. However, in Equia Fil group, only one restoration was not rated optimal marginal integrity at 12 month recall.

4. Discussion

This study was performed in order to evaluate the performance of a highly viscous glass ionomer cement in comparison with compomer that both of used extensively in pediatric dentistry. The rationale for using a highly viscous glass ionomer material was that it has some advantages in application compared to resin restorations, it has adhesive properties to enamel and dentin, and eliminate contraction shrinkage that occurs during polymerization in resin-based materials such as composites and compomers. Also the fluoride release by glass-ionomer can be of additional benefit (Scholtanus, & Huysmans, 2007).

Although there are clinical researches (De Amorim, Leal, Mulder, Creugers, & Frencken, 2014) (Hilgert et al., 2014) (Rutar, McAllan, & Tyas, 2000) on highly viscous glass ionomer cements that related to application in the atraumatic restorative treatment (ART) technique or not; published clinical study of Equia Fil restorations in primary molars is limited (Hilgert et al., 2014) (Rutar et al., 2000).

The total number of restorations made with the study material during the study period was higher than included here. When patients who cannot continue regular check-ups were excluded, the study was started with 64 restorations in symmetrical primary molar teeth in 24 pediatric patients aged 4-9 years. However due to not analyze completely missing restorations, evaluated number of restorations were decreased in time. In Equia Fil group, 27 samples for the retention criteria and 21 samples for the other criteria; in Dyract group 31 samples for the retention criteria and 29 samples for the other criteria were analyzed at 12 months.

When retention data obtained are analyzed although there was no statistically significant relationship between Equia Fil and Dyract XP groups regarding 6th month results, significant difference was observed at 12th month. While in Equia Fil group the success rate of 12-month control was 66,67%, in Dyract XP group it was recorded 93,55%. These results are in accordance with the retrospective study that clinically evaluate Equia Fil, ChemFil Rock and in class II cavities of primary teeth. The study showed although the clinical performance of Equia

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Fil was very similar with that of compomer for the first 6 months, at the end of 18 months the performance of the material was lower than that of compomer (Tirali, Çehreli, & Öğüş, 2017). The failure of the restorations in retention was due to fractures on the marginal edge and partial or complete loss of the restoration. Even though cavities with a wide and narrow occlusal surface were formed by selecting samples of dentin, which were not deep, in our study, more restoration loss was observed in the Equia Fil group compared to Dyract XP. It can be said Equia Fil restorations reported lower mechanical resistance compared to the restorations applied Dyract XP against occlusal loads.

This failure rate of Equia Fil at the proximal area may be based on adherence of glass ionomer to the metal matrices (Scholtanus, & Huysmans, 2007). Another explanation might be that it is very difficult to apply the varnish to the proximal wall of the restoration especially at the contact areas. Also it might be argued that the contact area is not sufficiently protected against water uptake after the initial hardening phase and does not allow proper hardening of the material. For that reason, Kupietzky, Atia Joachim, Tal, & Moskovitz, (2019) aimed to accelerate the curing time of the material (Equia Fil) with application heat during initial curing of the glass ionomer and thereby increase the durability of the restoration. However, they claimed that this application did not increase the retention rate of the material as thought. Heat-cured high-viscosity glass ionomer restorations showed 83% success rate of proximal restorations in primary molars up to 36 months. The researches highlighted high-viscosity glass ionomer restorations may be considered as an intermediate-lasting restorative option for proximal lesions in primary molars. The results of our study with 66,67% retention success rate of glass ionomer support results of the researchers.

The colour match was ideal in all Dyract XP restorations, but Equia Fil restorations pointed 47,62% success rate at the end of 12 months. Similarly, the success rate in color matching of a study by Burke & Bardha, (2013) on high viscosity glass ionomer cement (Fuji IX) to Class 1 and Class 2 cavities in permanent teeth, was recorded as 2.4%. It is stated that this situation is not surprising considering the generally accepted optimal appearance and opacity of glass ionomer materials and however, this did not appear to present any disturbance when patients were asked regarding the appearance of their restorations. It can be said that these results are similar to the results of our study, and translucency and color match of Dyract XP is superior to Equia Fil. Yet, considering that this study was performed on the molar teeth, it can be said color matching does not pose a negligible problem.

Clinically acceptable non-penetrating discoloration was observed along the restoration margin of 6.9% in the Dyract XP group and 4.76% in Equia Fil group at the end of 12-month evaluation period. Daou, Attin, & Göhring, (2009) suggest that the compomer may cause discoloration on the enamel edges, since Dyract compomers are better binding to dentine than enamel. In addition, it was reported that discoloration may consist of poor oral hygiene of patients, however, the rate of samples showing marginal discoloration in the compomer group is low (Papagiannoulis, Kakaboura, Pantaleon, & Kavvadia, 1999) (Welbury, Shaw, Murray, Gordon, & McCabe, 2000).

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In our study, in the Dyract XP group, even if it was not significant compared to the group applied Equia Fil, more marginal discoloration samples were observed. As the reason for less discoloration in Equia Fil restorations, it was thought that Equia Coat applied to the restoration surfaces prevents discoloration by providing a polished and flat surface.

Secondary caries was not observed at any time in either group. The absence of secondary caries in compomer restorations used in primary teeth is in accordance with the results of previous studies (Papagiannoulis et al., 1999) (Peters, Roeters, & Frankenmolen, 1996). The reason for the absence of secondary caries in the Equia Fil group can be explained by the fact that, as researchers noted, there is fluoride release from glass ionomer cements and the formation of a fluoride reserve in the tooth tissue near the restoration, as well as the absence of interference at the edge of the restoration (Forsten, 1998).

In our study, pulpal and periapical tissues were evaluated with periapical radiographs taken at the 6 and 12 month controls, similar to the previous studies (Markovic, & Peric, 2008) (Qvist, Poulsen, Teglers, & Mjor, 2010) that added the criterion of the "Endodontic treatment requirement" as well as the clinical evaluation of the restorations. At the 6-month recall, there was no gap between restoration and teeth in both groups; at 12 months, unsuccessful restoration compatibility was observed in one tooth in the Equia Fil group. In parallel with the clinical secondary caries evaluation results, no secondary caries was found in any of the two group restorations in the radiographic evaluation.

In both groups, 100% success was achieved at the 3 and 6 month-recall in the surface texture, it was observed that the success rate of Equia Fil group decreased after 12 months. In this case, the clinical performance of Equia was similar with that of Dyract XP for the first 6 months in accordance with the results of Tirali et al. study (2017). However, the retention and surface texture performance of Equia Fil was lower than that of compomer at the end of 12 months. Failure of Equia Fil's surface texture performance may be due to the surface coat has been abraded over time, it is concluded that it would be appropriate to renew the coat every six months.

The present study has a limitation that the cavities were prepared by the operator using high‐speed instrument and not standardized via any measurement, which increases variability between cavities. Another problem with the clinical follow-up study is completely falling restoration that cause not analyzing the samples and the increasing drop outs in time.

The first null hypothesis was that no difference in clinical performance exists between the high-viscosity glass-ionomer cement and compomer in primary molars was partly rejected. The second null hypothesis was that no difference in radiographic performance of the two types of restorations and it was accepted.

5. Conclusion

It is concluded that Equia Fil restorative system used provide a satisfactory result for proximal restorations in terms of marginal discoloration,

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secondary caries, postoperative sensitivity and anatomical form in primary teeth. However, retention, surface texture and color match results of Equia Fil showed less successful at the end of 12 months. Based on our results we suggest Equia Fil may be applied in smaller approximal cavities and to evaluate the restoration with six-month clinical controls. Yet, further research is required to confirm the results.

Conflicts of interest

The authors declare no conflicts of any financial, economic or professional interests about "Clinical and radiological performance of high-viscosity glass ionomer cement and compomer in class II restorations in primary molar teeth: 12- month follow-up " study.

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