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Evaluation of Clinical and Radiological Success of Primary Teeth Root Canal Treatments: A Retrospective Study

Süt Dişi Kök Kanal Tedavilerinin Klinik ve Radyolojik Başarılarının Değerlendirilmesi: Retrospektif Çalışma

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ABSTRACT Objective: To evaluate the success of primary teeth root canal treatments (RCTs) and restorations, as well as the effects of these treatments on the development and eruption of permanent teeth. **Material and Methods:** A total of 119 patients who underwent RCT of the primary teeth were included in the study. If the primary teeth to which the RCT was applied, the success of the restoration was evaluated according to the United States Public Health Service (USPHS) criteria. Root canal fillings were classified as overfilled, normal, or underfilled. The effect of the RCT on the eruption of permanent teeth was investigated. **Results:** The mean follow-up period was 40 months (range 12-72 months). The loss percentage in primary teeth increased as the follow-up period (>48 months) increased ($p<0.001$). A statistically significant difference was observed among the 3 restorative materials ($p=0.011$). There was a statistically significant difference in the rates of RCTs on primary teeth applied between dentists and specialist dentists ($p=0.003$). There was no significant difference between the level of root canal filling and the presence of teeth in the dental arch ($p>0.05$). Among the USPHS criteria, less sensitivity was reported in restorations made with glass ionomers and compomers than in those made with composites in terms of postoperative sensitivity ($p<0.001$). **Conclusion:** The type of material used for restorations and the clinical experience and skill of the dentist are essential factors that affect the success of RCT in primary teeth. Furthermore, in the current study, primary teeth RCT had no effect on the development and eruption of permanent teeth.

Keywords: Primary teeth; pulpectomy; United States Public Health Service; root canal treatment; success

ÖZET Amaç: Süt dişi kök kanal tedavilerinin (KKT) ve üst restorasyonlarının başarıları ile bu tedavilerin daimi dişlerin gelişim ve sürme sürecine etkilerinin değerlendirilmesi amaçlanmaktadır. **Gereç ve Yöntemler:** Çalışmaya süt dişlerine KKT yapılmış 119 hasta dâhil edildi. KKT uygulanan süt dişi ağızda ise restorasyonun başarısı Amerika Birleşik Devletleri Halk Sağlığı Servisi [United States Public Health Service (USPHS)] kriterlerine göre değerlendirildi. Kök kanal dolguları taşkın, normal veya eksik dolum olarak gruplandırıldı. Uygulanan KKT'nin alttaki daimi dişlerin sürmesi üzerindeki etkisi araştırıldı. **Bulgular:** KKT uygulanan dişlerde ortalama takip süresi 40 ay (12-72 ay) olarak belirlendi. Takip süresi uzadıkça (>48 ay) süt dişlerinde görülen kayıp yüzdelerinin arttığı gözlemlendi ($p<0,001$). Üç farklı restoratif materyal arasında istatistiksel açıdan anlamlı şekilde fark görüldü ($p=0,011$). Uzman diş hekimleri ile diş hekimleri arasında uygulanan süt dişi kök kanal tedavilerinin ağızda bulunma oranlarında istatistiksel olarak farklılık tespit edildi ($p=0,003$). Kök kanal dolgusunun seviyesi ile dişlerin ağızda bulunma oranları arasında anlamlı bir fark görülmedi ($p>0,05$). USPHS kriterlerinde postoperatif hassasiyet açısından kompozite kıyasla CİS ve kompomer ile yapılan restorasyonlarda daha az hassasiyetin görüldüğü bildirildi ($p<0,001$). **Sonuç:** Üst restorasyonlarda kullanılan materyalin çeşidi ile tedaviyi uygulayan hekimin klinik tecrübe ve becerisi, süt dişi kök kanal tedavisi uygulamalarında başarıyı etkileyen önemli faktörlerdendir. Ayrıca mevcut çalışmada, süt dişi KKT'lerinin daimi dişlerin gelişim ve sürme süreci üzerine etkisi gözlenmemiştir.

Anahtar Kelimeler: Süt dişi; pulpektomi; Amerika Birleşik Devletleri Halk Sağlığı Servisi; kök kanal tedavisi; başarı

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It is of great importance to preserve primary teeth in the dental arch for as long as possible, as they preserve the arch length and chewing functions in the child's orofacial development and continue to serve as a space maintainer for the permanent teeth that will emerge, thus preventing premature eruption.[1-3]

Root canal treatment (RCT) involves mechanical instrumentation, chemical debridement, and root canal filling (RCF) with an inert material to maintain the health of the periradicular tissues.[4,5] It is a frequently used treatment method for preserving primary molars with infected or necrotic pulp.[6-8]

Anatomical, developmental, and physiological differences between permanent and primary teeth indicate differences in RCF material selection criteria. The ideal RCF agent for primary teeth should be one that can be resorbed at a rate similar to the resorption rate of teeth roots, does not harm periapical tissues and permanent teeth germs, is quickly resorbed when carried from the apex, and has antiseptic solid properties.[9,10]

A viscous mixture of calcium hydroxide, iodoform, and silicone oil, closest to the ideal RCF material, is frequently used in pediatric dentistry clinics for primary teeth.[11] Studies conducted using this material have shown promising clinical and radiographic success.[6]

There are limited studies in the literature examining the effect of RCTs applied to primary teeth on the eruption process of permanent teeth. This study aimed to investigate the success of primary teeth RCTs and restorations and the effect of RCTs on the development and eruption of permanent teeth. The null hypothesis (H0) of the research was determined as follows: "root canal treatments performed by specialist dentists demonstrate superior success rates, and RCT do not exert any adverse effects on the developmental and eruptive processes of the permanent dentition".

MATERIAL AND METHODS

ETHICAL APPROVAL

The study was approved by the Clinical Research Ethics Committee of Recep Tayyip Erdoğan University Faculty of Medicine (date: February 19, 2019; no: 2019/05). The ethical principles of medical research on human subjects in the World Medical Association Declaration of Helsinki were followed.

STUDY DESIGN

The study was conducted by examining the data of 119 patients who were treated at Recep Tayyip Erdoğan University, Faculty of Dentistry, Pediatric Dentistry Clinic between January 1, 2019-December 31, 2020 and who underwent RCT on primary teeth, were systemically healthy, did not have any mental disorders, and agreed to participate in the study. Patients who had systemic diseases or mental disorders, could not cooperate, or did not agree to participate in the study were excluded from the study. As previous studies in the literature have reported that the location of the primary teeth had no effect on RCT success, no filtering was applied when selecting the teeth.[9,10] The primary teeth RCTs performed by specialist dentists and dentists were methodologically similar. There was no difference between the materials used during RCT procedures and the RCF materials. Patients who underwent RCT during the relevant period were referred to the clinic for routine examinations and informed regarding the study. The parents signed informed consent forms before the study. After recording demographic data, the primary teeth RCT were examined clinically and radiographically.

Intraoral examinations of the patients were evaluated for mobility, percussion/palpation sensitivity, and fistula/edema in the primary teeth on which RCT was performed. The restorations of the teeth were also evaluated and divided into subgroups of glass ionomer (GI), compomer, and composite. The success of restoration was examined according to the United States Public Health Service (USPHS) criteria regarding total or partial fracture, complete loss of restoration, approximal contact, marginal adaptation, marginal discoloration, anatomical form, secondary caries, postoperative sensitivity, and surface roughness.

Periapical radiographs obtained immediately after treatment were examined, and RCFs were grouped as overfilling, normal, or underfilling. RCT was performed in cases where the primary teeth were

extracted before the permanent teeth erupted, and this was considered a premature loss. To determine the internal reliability of the researcher for the USPHS criteria, 20 randomly selected patients were re-evaluated 3 weeks after the patients' examination. It was investigated whether the filling level of RCTs applied to primary teeth resulted in premature eruption of permanent teeth. Additionally, it was evaluated whether RCTs caused anomalies such as rotation and hypoplasia in permanent teeth compared to the contralateral.

STATISTICAL ANALYSIS

Statistical analysis was conducted using Jamovi Software (v2.3.28). Descriptive analyses were performed to determine frequencies, and a chi-square test was used to compare categorical variables. Intrarater agreement was assessed by Cohen's Kappa coefficient. The statistical significance level was set at $p<0.05$.

RESULTS

As a result of kappa analysis, a high level of intraobserver agreement was determined for USPHS ($\kappa=0.916$). Of the 119 patients who participated in the study, 39% (n=46) were female and 61% (n=73) were male. The distribution of data in this study is presented in Table 1.

TABLE 1: Distribution of study data

	n	%
Gender		
Female	46	39.0
Male	73	61.0
Teeth with root canal treatment		
Maxilla	56	47.0
Mandible	63	53.0
Teeth with root canal treatment		
Anterior	25	21.0
Posterior	94	79.0
Follow-up period		
12-24 months	43	36.1
25-48 months	43	36.1
>48 months	33	27.7
Restoration		
Glass ionomer	58	48.7
Compomer	33	27.7
Composite	28	23.6
Practitioner		
Dentist	55	46.0
Specialist dentist	64	54.0
Presence of root canal treated teeth		
The teeth are in the dental arch.	22	18.0
The teeth are not in the dental arch.	97	82.0
RCF level		
Underfilled	51	43.0
Normal	31	26.0
Overfilled	37	31.0
Total	119	100

RCF: Root canal filling

No statistically significant relationship was found between the presence of root canal-treated teeth and gender ($p>0.05$) (Table 2). The rates of the presence of maxilla and mandible teeth after RCT did not differ from each other ($p>0.05$). The percentage of loss in primary teeth increased as the follow-up period increased (>48 months) ($p<0.001$). There was a statistically significant difference between the 3 different restorative materials, and the rate of absence in the mouth was higher in the teeth treated with the composite and GI ($p=0.011$). There was no significant difference between the level of RCFs and the rates of presence of the teeth in the dental arch ($p>0.05$). When the rates of presence of the primary teeth RCTs applied between dentists and specialist dentists were examined, it was determined that specialist dentists performed statistically more successful treatments ($p=0.003$).

Resorption was observed in 9% of teeth (n=22), mobility in 13.6%, percussion/palpation in 18.1%, fistula/edema in 9%, abscess in 18.1%, and periapical/furcal lesions in 31.8%. It was determined that 60.8% of teeth (n=59) that were not in the dental arch were physiologically lost (n=18), 18.5% were extracted due to crown damage, and 20.7% (n=20) were lost due to periapical/furcal lesions. Permanent teeth erupted in 68% of the primary teeth but not in the dental arch. Rotation/hypoplasia was detected in 21.2% of the permanent teeth that erupted in place of the primary teeth, whereas no anomaly was observed in 78.8%. Permanent teeth erupted in 57.7% of the primary teeth in the contralateral. Rotation/hypoplasia was observed in 21.4% of the contralateral permanent teeth that had erupted into the arch, whereas no anomaly was observed in 78.6%.

TABLE 2: Comparison of study data with the status of the teeth treated with root canal treatment

	RCT applied teeth			
	In dental arch	Not in dental arch	Total	
	n (%)	n (%)	n	p value
Gender				
Female	10 (21.7)	36 (78.3)	46	0.468
Male	12 (16.4)	61 (83.6)	73	
Teeth with RCT				
Maxilla	12 (19.0)	51 (81.0)	63	0.867
Mandible	10 (17.9)	46 (82.1)	56	
Follow-up period				
12-24 months	17 (39.5)	26 (60.5)	43	**<0.001***
25-48 months	5 (11.6)	38 (88.4)	43	
>48 months	0 (0)	33 (100.0)	33	
Restoration				
Glass ionomer	10 (17.2)	48 (82.8)	58	**0.011***
Compomer	11 (33.3)	22 (66.7)	33	
Composite	1 (3.6)	27 (96.4)	28	
RCF Level				
Underfilled	7 (13.7)	44 (86.3)	51	0.445
Normal	6 (19.4)	25 (80.6)	31	
Overfilled	9 (24.3)	28 (75.7)	37	
Practitioner				
Dentist	4 (7.3)	51 (92.7)	55	**0.003***
Specialist dentist	18 (28.1)	46 (71.9)	64	

*p<0.05 significance level, chi-square test. RCT: Root canal treatment; RCF: Root canal filling

The restorative materials used were evaluated for color match, retention, marginal adaptation, marginal discoloration, secondary caries, anatomical form, surface roughness, and postoperative sensitivity according to the USPHS criteria (Table 3). Regarding postoperative sensitivity, less sensitivity was reported in restorations made with GI and compomer compared to composite ($p<0.001$). No statistically significant differences were found between the other criteria and restorative materials ($p>0.05$).

The success of the restorations according to the USPHS criteria and the practitioner performing the RCT are shown in Table 4. No significant relationship was observed between marginal discoloration, marginal adaptation, color match, secondary caries, anatomical form, postoperative sensitivity, and the practitioner's RCT experience ($p>0.05$).

The relationship between the follow-up period and practitioner, restoration material, and RCF level is shown in Table 5. After RCT, it was observed that the follow-up periods of the teeth treated by specialist dentists were significantly longer than 48 months, while the follow-up periods for dentists were between 12-24 months ($p<0.001$). No significant difference was found between the applied restoration materials and the follow-up periods ($p>0.05$). The follow-up periods of the primary teeth with underfilling levels were significantly longer than those of the normal and overfilling groups ($p=0.011$).

The relationship between the RCF level and premature eruption of the permanent teeth is shown in Table 6. No statistically significant relationship was found between the RCF level and premature eruption of the permanent teeth ($p>0.05$).

DISCUSSION

RCT applications, which are performed to preserve the health and integrity of the primary teeth until the physiological loss time and to prevent possible adverse effects on the permanent teeth that will replace them, are a widely used treatment method with a high success rate.[12]

Although RCTs are frequently applied to primary teeth, they have that the studies conducted focused more on the comparison of materials. In the literature, the number of studies on the effects of restoration and treatment after RCT of permanent teeth is limited. Therefore, the current study aimed to evaluate the success of RCTs and restorations applied to primary teeth and the effects of these treatments on the development and eruption of permanent teeth.

Different materials are used in clinical practice for RCT. In the literature, it has been reported that calcium hydroxide and iodoform complexes, which are frequently used in RCT in primary teeth, have very high success rates in routine clinical practice.[10,13] In this study, the success of primary teeth using $Ca(OH)_2$ and iodoform complexes as RCF agents was evaluated. Thus, the objective was to obtain information regarding the long-term clinical and radiographic efficacy of this agent, which is frequently utilized as RCF material in pediatric dentistry clinics and demonstrates successful outcomes.

TABLE 3: Evaluation of the relationship between USPHS criteria and the restorative material

	GI n (%)	Compomer n (%)	Composite n (%)	Total n	p value
Retention					
A	9 (90.0)	10 (90.9)	1 (100.0)	20 (90.9)	0.946
B	0	0	0	0	
C	1 (10.0)	1 (9.1)	0 (0)	2 (9.1)	
Color match					
A	3 (30.0)	8 (72.7)	0 (0)	11 (50.0)	0.225
B	6 (60.0)	2 (18.2)	1 (100.0)	9 (40.9)	
C	1 (10.0)	1 (9.1)	0 (0)	2 (9.1)	
Marginal discoloration					
A	4 (40.0)	5 (45.5)	0 (0)	9 (40.9)	0.466
B	0 (0)	2 (18.2)	0 (0)	2 (9.1)	
C	6 (60.0)	4 (36.4)	1 (100.0)	11 (50.0)	
Marginal adaptation					
A	4 (40.0)	6 (54.5)	0 (0)	10 (45.5)	0.587
B	0 (0)	1 (9.1)	0 (0)	1 (4.5)	
C	6 (60.0)	4 (36.4)	1 (100.0)	11 (50.0)	
Secondary caries					
A	4 (40.0)	7 (63.6)	0 (0)	11 (50.0)	0.523
B	5 (50.0)	4 (36.4)	1 (100.0)	10 (45.5)	
C	1 (10.0)	0 (0)	0 (0)	1 (4.5)	
Anatomical form					
A	5 (50.0)	7 (63.6)	0 (0)	12 (54.5)	0.581
B	4 (40.0)	4 (36.4)	1 (100.0)	9 (40.9)	
C	1 (10.0)	0 (0)	0 (0)	1 (4.5)	
Postoperative sensitivity					
A	9 (90.0)	11 (100.0)	0 (0)	20 (90.9)	**<0.001***
B	0 (0)	0 (0)	1 (100.0)	1 (4.5)	
C	1 (10.0)	0 (0)	0 (0)	1 (4.5)	
Surface roughness					
A	4 (40.0)	2 (18.2)	1 (100.0)	7 (31.8)	0.459
B	4 (40.0)	7 (63.6)	0 (0)	11 (50.0)	
C	2 (20.0)	2 (18.2)	0 (0)	4 (18.2)	

*p<0.05 significance level, chi-square test. GI: Glass ionomer

It is thought that factors such as gender and teeth number may affect treatment results in RCT. Studies have shown that gender does not affect the clinical and radiographic success of RCT.[8,14] In the current study, it was determined that there was no significant relationship between the presence of teeth and gender, which is consistent with the literature.

RCT studies have reported that there is no statistically significant difference between the jaw where the treated teeth are located and the success of the treatment.[8,14] In this study, no difference was found between the position of the teeth and the success of treatment in RCT treated teeth, regardless of the maxilla-mandible or anterior-posterior region.

In various studies examining the success of pulpectomy treatments, follow-up periods vary between 6-113 months.[2] Although long-term clinical studies provide the opportunity to evaluate the success of materials over time more reliably. In some cases, they may cause a loss of information due to decreased patient participation, resulting in the inability to reach a definitive conclusion.[15] In a retrospective study with a 5-year follow-up conducted by Chen et al. it was reported that the rate of teeth remaining in

TABLE 4: Evaluation of the relationship between USPHS criteria and practitioner

	Dentist n (%)	Specialist dentist n (%)	Total n	p value
Retention				
A	16 (88.9)	4 (100)	20 (90.9)	0.484
B	0 (0)	0 (0)	0 (0)	
C	2 (11.1)	0 (0)	2 (9.1)	
Color match				
A	10 (55.6)	1 (25)	11 (50)	0.295
B	6 (33.3)	3 (75)	9 (40.9)	
C	2 (11.1)	0 (0)	2 (9.1)	
Marginal discoloration				
A	8 (44.4)	1 (25)	9 (40.9)	0.507
B	2 (11.1)	0 (0)	2 (9.1)	
C	8 (44.4)	3 (75)	11 (50)	
Marginal adaptation				
A	9 (50)	1 (25)	10 (45.5)	0.526
B	1 (5.6)	0 (0)	1 (4.5)	
C	8 (44.4)	3 (75)	11 (50)	
Secondary caries				
A	10 (55.6)	1 (25)	11 (50)	0.412
B	7 (38.9)	3 (75)	10 (45.5)	
C	1 (5.6)	0 (0)	1 (4.5)	
Anatomical form				
A	11 (61.1)	1 (25)	12 (54.5)	0.302
B	6 (33.3)	3 (75)	9 (40.9)	
C	1 (5.6)	0 (0)	1 (4.5)	
Postoperative sensitivity				
A	17 (94.4)	3 (75)	20 (90.9)	0.088
B	0 (0)	1 (25)	1 (4.5)	
C	1 (5.6)	0 (0)	1 (4.5)	
Surface roughness				
A	6 (33.3)	1 (25)	7 (31.8)	0.182
B	10 (55.6)	1 (25)	11 (50)	
C	2 (11.1)	2 (50)	4 (18.2)	

*p<0.05 significance level, chi-square test

TABLE 5: Evaluation of the relationship between the follow-up period and the practitioner, restorative material, and RCF level

	12-24 months n (%)	25-48 months n (%)	>48 months n (%)	Total n	p value
Practitioner					
Dentist	33.0 (51.6%)	22.0 (34.4%)	9.0 (14.1%)	55	<0.001*
Specialist dentist	10.0 (18.2%)	21.0 (38.2%)	24.0 (43.6%)	64	
Restoration					
Glass ionomer	19.0 (32.8%)	20.0 (34.5%)	19.0 (32.8%)	58	0.488
Compomer	12.0 (36.4%)	15.0 (45.5%)	6.0 (18.2%)	33	
Composite	12.0 (42.9%)	8.0 (28.6%)	8.0 (28.6%)	28	
RCF level					
Underfilled	13.0 (25.5%)	18.0 (35.3%)	20.0 (39.2%)	51	**0.011***
Normal	9.0 (29.0%)	15.0 (48.4%)	7.0 (22.6%)	31	
Overfilled	21.0 (56.8%)	10.0 (27.0%)	6.0 (16.2%)	37	

*p<0.05 significance level, Chi-square test. RCF: Root canal filling

TABLE 6: Evaluation of the relationship between RCF level and premature eruption of the permanent teeth

	Premature eruption			
RCF	No (n=105)	Yes (n=14)	Total (n=119)	p value
Underfilled	46.0 (43.8%)	5.0 (35.7%)	51.0 (42.9%)	
Normal	25.0 (23.8%)	6.0 (42.9%)	31.0 (26.1%)	0.303
Overfilled	34.0 (32.4%)	3.0 (21.4%)	37.0 (31.1%)	

*p<0.05 significance level, chi-square test. RCF: Root canal filling

the mouth decreased as the follow-up period increased.[14] Similar to the findings of Chen et al. in this study, the percentage of loss in teeth increased significantly as the follow-up period (>48 months) increased. Following RCT performed on primary teeth, the patient should be followed up through routine interim examinations. This approach facilitates early intervention to prevent adverse outcomes in the restoration or root canal system, thereby mitigating potential long-term post-treatment complications.

It is known that the quality of the coronal restoration is an essential factor in the success of endodontic treatments applied to primary teeth.[16] GIs, amalgams, compomers, composites, or stainless steel crowns (SSCs) are used for the restoration following RCT.[17] These 2 materials were not used in the study because of the mercury content of amalgam, the high cost of SSCs, and parental concerns about the unaesthetic appearance of both materials. A study evaluating endodontic treatments in primary teeth determined that GIs reduced the risk of complications compared to other materials. At the same time, the composite increased the risk, regardless of the observation period.[18] In this study, the rates of teeth restored with GI, compomer and composite were similar. This result is similar to that of a study conducted by Sari et al.[17]

Studies have reported that the practitioner's clinical experience is effective in the prognosis of endodontic treatments.[19] Studies involving dentists and interns with different experiences have emphasized that the low success rate in endodontic treatments may be related to the interns' need for more clinical experience.[20] In this study, dentists had significantly lower rates of teeth presence in dental arch compared to specialist dentists, which was similar to the results of the literature.

Pulpal treatments applied to primary teeth may affect the development of permanent teeth. Moskovitz et al. who investigated the long-term effects of RCT applied to primary molars on permanent teeth, reported hypocalcified defects on the enamel

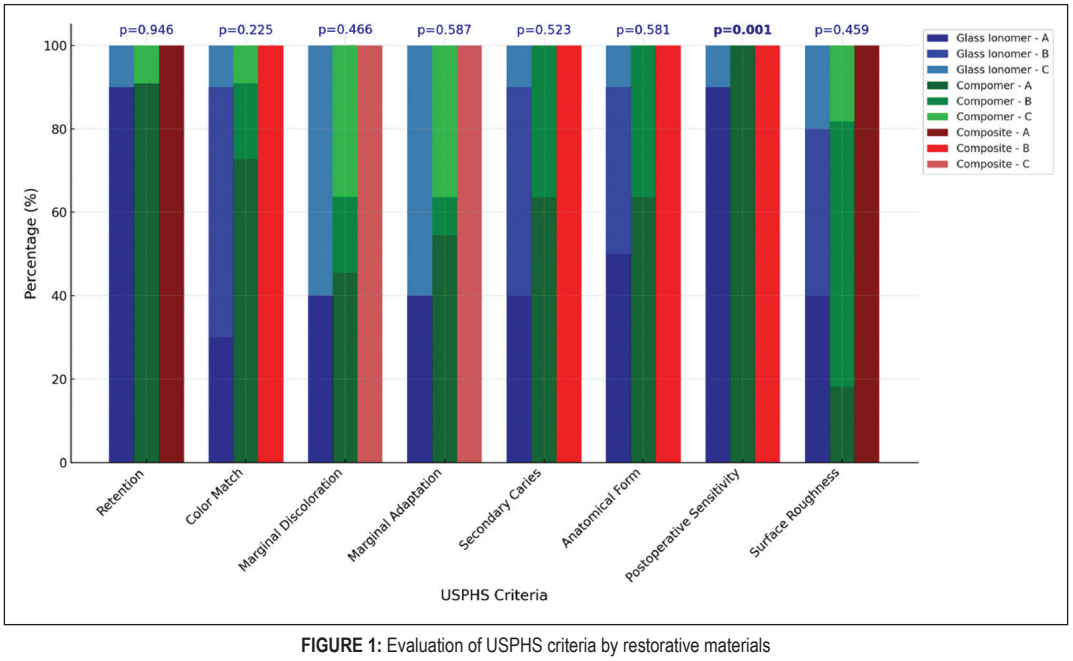

FIGURE 1: Evaluation of USPHS criteria by restorative materials
USPHS: United States Public Health Service

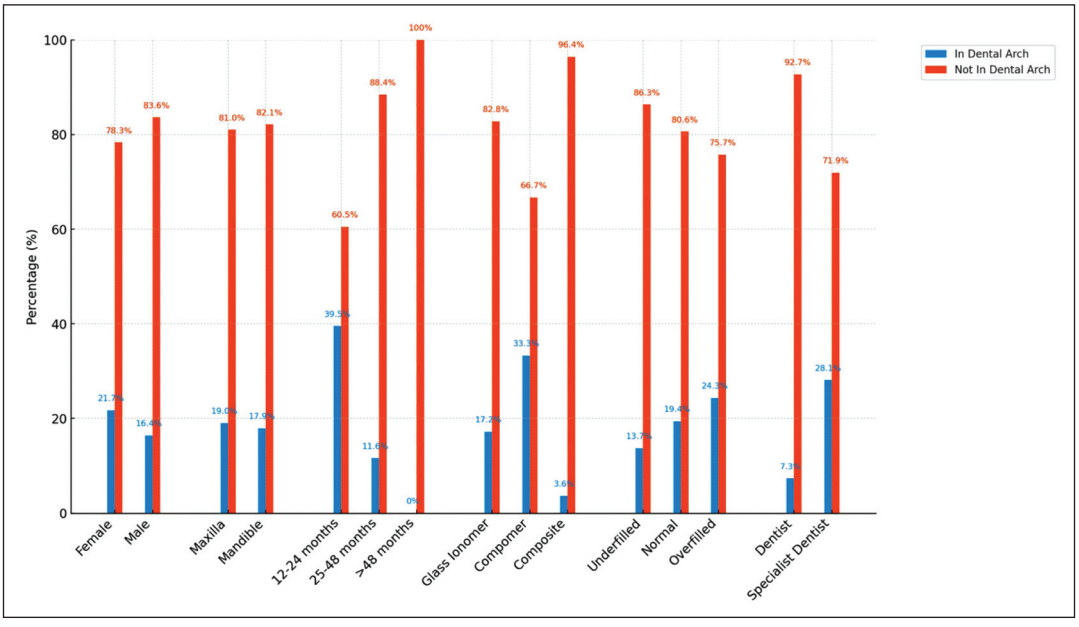

FIGURE 2: Comparison of study data according to the presence of teeth in dental arch

surface and rotation in some permanent teeth.[2] In a study examining the effect of RCT on permanent teeth and exfoliation time, it was determined that the treatment could create an enamel defect in the permanent teeth and that the treated teeth were lost earlier than those on the contralateral side.[21] In this study, no significant relationship was observed between RCF level and early eruption in teeth. Therefore, the H0 hypothesis of the study "root canal treatments performed by specialist dentists demonstrate superior success rates, and RCT do not exert any adverse effects on the developmental and eruptive processes of the permanent dentition." was accepted.

Resorption of the RCF material must occur when the root of the primary teeth is resorbed during exfoliation to allow normal eruption.[12] The study by Coll et al. showed that teeth with overfilled RCFs had a lower success rate than teeth with normal and underfilled RCFs.[18] In another study, normal and overfilled root canals of primary molars had higher radiographic success rates than underfilled teeth.[22] In the current study, RCT teeth with underfilled had a longer survival rate than normal and overfilled teeth. A long follow-up period was likely effective in the emergence of this result.

The limitations of this study encompass the inability to investigate additional factors that may influence treatment efficacy, such as patients' socioeconomic status, oral hygiene practices, and cooperation with treatment protocols. Furthermore, only $Ca(OH)_2$ and iodoform complex among RCF agents were evaluated in the present study, and the clinical and radiographic efficacy of alternative materials should be examined.

CONCLUSION

Coronal coverage of the material used in the restoration and the clinical experience and skill of the practitioner are essential factors affecting the success of RCT applications. Long-term studies are needed to evaluate the effects of RCT on the development of permanent teeth. It is expected that the results of this study, within its conditions and limitations, will guide further research.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

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