Cumhuriyet Dental Journal: 2021; 24(1)
e-ISSN 2146-2852
Doi:10.7126/cumudj.829414

Original research

THE SMEAR LAYER REMOVAL EFFICIENCY OF DIFFERENT CONCENTRATIONS OF EDTA IN PRIMARY TEETH: A SEM STUDY

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ABSTRACT

Objectives: The present study aims to evaluate the effects of different concentrations of ethylenediamine tetraacetic acid (EDTA) on smear layer removal in primary teeth by using scanning electron microscopy (SEM).

Materials and Methods: The present study was performed with 28 extracted upper primary incisors assigned into four main groups (n=7) as 5%, 10% and 17% EDTA, and 1% sodium hypochlorite (NaOCl). The root canal surfaces (coronal, middle and apical) were scanned by SEM and scores of smear layer removal were recorded and compared after the root canal irrigation procedures. The results were analyzed using Kruskal–Wallis, Friedman and Dunn tests.

Results: In all the root portions, although EDTA groups removed the smear layer more effectively than NaOCl, a statistically significant difference was observed between 17% EDTA and 1% NaOCl only in middle third ($p < 0.05$). Also, smear layer was removed more effectively in coronal than apical in most of the groups (10% EDTA, 17% EDTA and 1% NaOCl) ($p < 0.05$). Erosive defects were seen in 10% EDTA and 17% EDTA groups, mostly in 17% EDTA group. These findings were not detected in 5% EDTA and 1% NaOCl group.

Conclusions: It is possible to recommend the use of 5% EDTA irrigation solution in root canal treatment of primary teeth due to its similar smear layer removal efficacy with NaOCl and high concentration EDTA groups, low erosive potential and low concentration for periapical safety.

Keywords: EDTA, root canal irrigants, smear layer.

Received : 21.11.2020
Accepted : 18.12.2020

How to Cite: Demirel A. The Smear Layer Removal Efficiency of Different Concentrations of EDTA in Primary Teeth: A Sem Study. Cumhuriyet Dent J 2021;24:1:57-65.
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INTRODUCTION

The root canal treatment process of primary teeth with necrotic or irreversibly inflamed pulp are quite important to avoid the consequences of the dental infection. The success of root canal treatment involving the instrumentation, irrigation and obturation of the root canal system, depends on the chemo-mechanical debridement and effective removal of infective microorganisms in root canals.[1-6]

Smear layer formed during root canal instrumentation is a composite tissue containing dentin, necrotic and viable tissue residues, odontoblastic remnants and bacteria.[5,7,8] The smear layer reduces the permeability of dentin by penetrating into the dentinal tubules,[5,9] inhibits the effects of antibacterial agents, the seal of the root canal filling and complete removal of microorganisms in root canal.[8,10,11] Therefore, an important factor that increases the success of root canal treatment is the removal of the smear layer.[2,5,6,10]

Especially in primary teeth, the smear layer removal is as important as mechanical instrumentation.[5,12] The presence of inaccessible areas such as ramifications, lateral and accessory canals or morphological variations in the root canals especially in primary molar teeth increases the need for chemical debridement.[6,8,12-15] Moreover, the inability to provide an effective obturation and lateral condensation in root canals due to increase the diameter of apical foramen with the physiological root resorption especially in the apical portion of the roots, highlight effective smear layer removal for long-term success.[6,12]

Numerous different irrigation solutions/ protocols are used in primary tooth pulpectomies for smear layer removal.[6-8,13,16] Sodium hypochlorite (NaOCl) is frequently used due to its potent antibacterial, antiviral and antifungal effects and necrotic/organic tissue dissolving ability. However, although NaOCl dissolves the organic part of the smear layer, it is reported that it has a limited effect in removing the inorganic part.[7] Ethylenediamine tetraacetic acid (EDTA), which is a chelator agent, removes the especially inorganic part of the smear layer in root canal irrigation, however, it has been known that its antibacterial effect is limited. Also, the prolonged exposure of EDTA with the root canal walls results in excessive removal of peritubular and intratubular dentin, therefore, the combined use of NaOCl and EDTA agents is recommended for both antibacterial effect and effective smear layer removal.[2,6,8]

In permanent teeth, EDTA is mostly used in 17% concentration in irrigation protocols. However, differences in water and organic content and hardness of the structure of primary tooth dentin require the use of different EDTA concentrations.[2,5,6,14] Even lower concentrations than those used in permanent teeth cause erosive defects and excessive removal of dentine in primary tooth root dentin.[2,5,6] Although the researches investigating the use of 10% to 17% EDTA, there is no certain protocol that has been proven for the use of EDTA in primary teeth and evidence-based long-term clinical results. Morever, sufficient detected information is not available for the concentrations of <10% EDTA. Therefore, in the present study, it is aimed to evaluate the effects of different concentrations of EDTA as final irrigation solution on smear layer removal in primary root canals under in-vitro conditions.

MATERIALS AND METHODS

Ethical Approval and Statements

Ethical approval for the presented study was provided by the Clinical Research Ethics Committee of Ankara University, Faculty of Dentistry (approval decision number: 11/04, decision date: 14.10.2020). Wherefore the extracted human primary teeth were used in this study, written and verbal consents was obtained from child patients and their parents. The principles of the Declaration of Helsinki were followed in the study. Also, the presented study has followed the Checklist for Reporting In-vitro Studies (CRIS) guidelines for in-vitro studies as discussed in the 2014 concept note by Krithikadatta *et al.*[17]

Sample Size Calculation and Including/ Excluding Criteria

The statistical power analysis was carried out to determine the sample size for this in-vitro study. For the determination the differences between the

study groups (effect size: 0.70) indicated that a minimum of 28 deciduous incisor teeth were required to detect a significant difference (80% power and 5% type I error). In this study, 28 upper primary incisor teeth extracted due to extent dental caries and periapical lesion, dento-alveolar abscess, non-restorable crown structure or dento-alveolar trauma were used. Considering the including criteria for the presented study, teeth were selected to be as single rooted, without root anomalies, root resorption level not more than one third of the total root length (on the basis of Kramer and Ireland[18]) and apical foramen size not larger than the #50 K file diameter. In addition, root fractures, cracks, macro calcifications, internal root resorption or root canal obliteration were examined with a stereomicroscope and the teeth containing mentioned conditions were excluded from the study procedures.

Tooth Storing Procedures

The organic debris, PDL residues and remnants on the outer root surfaces of the teeth included in the study were removed using 2.5% NaOCl solution and periodontal curette and washed under tap water. Then, teeth were kept in 0.9% Physiological Saline (PS) solution until the procedures of the study.

Study Procedures

The teeth prepared as mentioned above were embedded in wax blocks as the roots to be remain inside to carry out the study procedures. Afterwards, the endodontic access cavity was prepared using high speed fissure burs. The coronal pulp tissue and residues were removed using a sharp excavator and slow speed round burs and the pulp chamber was irrigated with saline solution. The pulp tissue in root canal was removed using an appropriate size barbed broach and the root canals were irrigated with PS to remove tissue residues. The working length for each tooth was determined on periapical radiography as to be 2 mm shorter than the root apex using a #15 K-file (G-star Medical Co., Ltd., Guangdong, China). The root canal instrumentation was performed using #15 to 45 K-files. Between each file and at the end of all instrumentation (final irrigation), the root canals were irrigated with different irrigation protocols. The root canal irrigation procedures were performed with 27 gauged needle tip attached to 2 ml dental syringe (Ayset Medical Products, Adana, Turkey). The needle was placed into root canal to be 2 mm shorter than the working length and the canals were irrigated with appropriate finger pressure.

Determination of the Study Groups

28 teeth prepared for the study were randomly assigned to 4 different groups (n=7) and irrigation procedures for each group are given below.

Group 1- 5% EDTA Group: Between each file, the canals were irrigated with 10 ml of 1% NaOCl. 5% concentration of EDTA was used as the final irrigation solution and the canals were irrigated with 10 ml of 5% EDTA for 1 min. after all instrumentation procedures. Finally, the canals were dried with paper points between NaOCl and EDTA solutions.

Group 2- 10% EDTA Group: Between each file, the canals were irrigated with 10 ml of 1% NaOCl. 10% concentration of EDTA was used as the final irrigation solution and the canals were irrigated with 10 ml of 10% EDTA for 1 min. after all instrumentation procedures. Finally, the canals were dried with paper points between NaOCl and EDTA solutions.

Group 3- 17% EDTA Group: Between each file, the canals were irrigated with 10 ml of 1% NaOCl. 17% concentration of EDTA was used as the final irrigation solution and the canals were irrigated with 10 ml of 17% EDTA for 1 min. after all instrumentation procedures. Finally, the canals were dried with paper points between NaOCl and EDTA solutions.

Group 4- 1% NaOCl Group (Control Group): Between each file, the canals were irrigated with 10 ml of 1% NaOCl. 1% concentration of NaOCl was used as the final irrigation solution and the canals were irrigated with 10 ml of 1% NaOCl for 1 min. after all instrumentation procedures. Finally, the canals were dried with paper points.

SEM Analysis and Scoring the Samples

The amount of removal of the smear layer was evaluated and scored using the SEM (Carl Zeiss, Gemini SEM 500-71-08, Germany) in the present study. Prior to SEM analysis, the roots were removed from wax blocks and divided into two halves

mesiodistally along the longitudinal axis using a chisel and mallet. For SEM analysis, each specimen was dehydrated in 25%, 50%, 75%, and 90% ethanol series for 25 min, and finally 100% ethanol for 60 min. The samples were point-dried and mounted on aluminum stubs. Subsequently, the specimens were sputter-coated with 135 A0 thickness gold-palladium particles. Each specimen was evaluated in 3 sections along the inner coronal, middle third and apical root surfaces. In the evaluation, it was important that the images were at the same magnification (x3.5K). The photos of the SEM images were scored blindly at 1-week intervals by the same researcher who was not aware of which sample belonged to which study groups. The assessment of what amount the smear layer was removed was made on the basis of the following criteria:[3,6]

Score 0: absence of the smear layer (majority of dentinal tubules open)

Score 1: Moderate presence of the smear layer and outline of tubules partially visible (majority of the dentinal tubules partially obliterated)

Score 2: presence of abundant smear layer (majority of the dentinal tubules complete obliterated)

Statistical Analysis

Intra-examiner validity (for 1-week interval) was assessed by Kappa statistics. Kappa value was 0.9, demonstrating good reliability. The differences between groups were analyzed with Kruskal-Wallis test, and the differences between coronal-middle-apical third of the roots were analyzed with Friedman test. Binary comparisons were performed with Dunn's test. The statistical significance level was considered as %5.

RESULTS

According to statistical comparisons, in coronal and apical region of the roots, there was no statistically significant difference between all the groups, while 17% EDTA group was statistically significantly superior compared to 1% NaOCl group in the middle third (p=0,016) (Table 1, Figure 2 to 4).

Table 1: SEM evaluation scores and the median values of all the groups in coronal, middle and apical third of the roots.

Irrigation Groups	Coronal Third	Middle Third	Apical Third	p	
5% EDTA Group	0 [0 – 1]	1 [0 – 1]	1 [0 – 2]	0.104	-
10% EDTA Group	0 [0 – 1]	0 [0 – 1]	1 [0 – 2]	0.006	Coronal-Apical: p<0.05
17% EDTA Group	0 [0 – 0]	0 [0 – 1]	1 [0 – 2]	0.039	Coronal-Apical: p<0.05
1% NaOCl Group	1 [0 – 1]	1 [0 – 2]	2 [1 – 2]	0.035	Coronal-Apical: p<0.05
p	0.061	0.016	0.068		
	-	Group 3-Group 4: p<0.05	-		

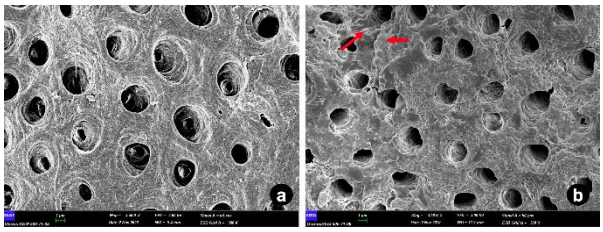

Figure 2: SEM images of the coronal third for Group 1 (a) (Score 0) and middle third for Group 2 (b) (Score 0). Note the erosive defects and peritubular dentin removal around the tubules in the second image (arrows).

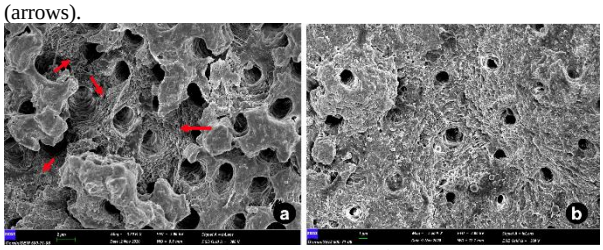

Figure 3: SEM images of the coronal third for Group 3 (a) (Score 0) and middle third for Group 2 (b) (Score 1). Note the severe erosive defects and excessive intra/peritubular dentin in the first image (arrows).

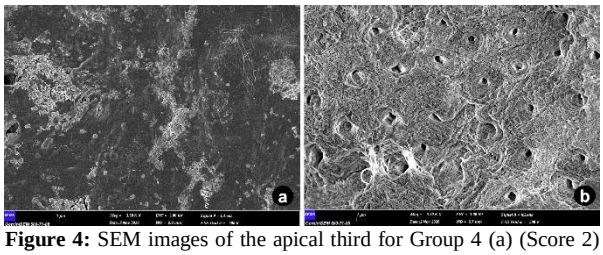

Figure 4: SEM images of the apical third for Group 4 (a) (Score 2) and middle third for Group 4 (b) (Score 1). Note the unsufficiently removed smear layer in the first image.

According to the scoring values obtained with the evaluation of the SEM images, the scores of the EDTA irrigation groups (Groups 1, 2 and 3) were found to be lower than the NaOCl group, indicating that EDTA groups removed the smear layer more effectively (Table 1, Figure 1) in all root thirds.

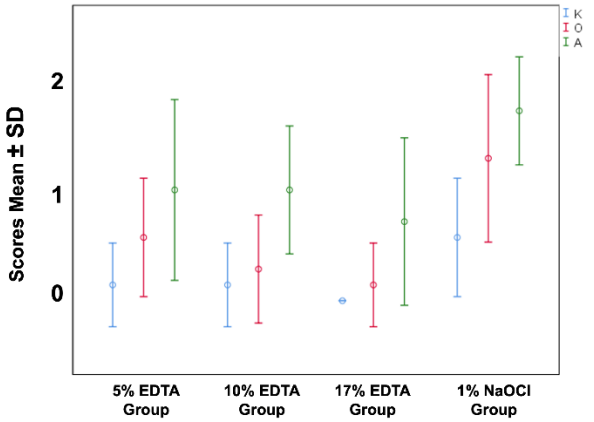

Figure 1: The distribution of SEM evaluation scores of all the groups in coronal, middle and apical third of the roots.

In the evaluation of the root surfaces, the smear layer was more effectively removed in coronal third compared to apical third with the statistically significant difference in 10% EDTA group, 17% EDTA group and 1% NaOCl group (p=0.006, p=0.039, p=0.035, respectively) (Table 1, Figure 2 to 4).

Additionally, erosiv defects, excessive intertubular and peritubular dentin removal was mostly seen in 10% and 17% EDTA group (Figure 2b and 3a) (more in 17%). However, mentioned defects were not observed in 5% EDTA and 1% NaOCl group. Also, erosive defects were mostly found in the coronal and middle thirds, and not detected in apical third.

DISCUSSION

The removal of the smear layer in root canals of the primary teeth is an important factor that increases the final success of the treatment.[2,5,7,14,19] Because the smear layer obliterates the dentinal tubules and creates a barrier between canal system and dentin surfaces, it negatively affects the adaptation of canal sealers and the effectiveness of irrigants and medicaments.[14-16] The success of pulpectomies applied with smear layer removal has also been confirmed in clinical studies. It was reported that pulpectomy of primary teeth with smear layer removal showed higher success rates at the end of the follow-up period in clinical trials.[7,19] In addition to the disadvantages of the smear layer, accessory canals in primary roots and the physiological root resorption process cause the unsuccess conditions in endodontic treatment.[14,20-22] Moreover, the difficulties of accessing these areas such as mentioned anatomical variations, ramifications, lateral branches and incomplete seal of the antibacterial filling material increase the need for removal of this layer, especially in primary molar teeth which have more narrow and divergent root canals.[5,6,8,14] Therefore, it was aimed to evaluate the effects of different irrigation materials on smear layer removal in primary teeth in this study.

NaOCl is the most commonly used irrigation solution in pediatric endodontic treatments.[8,23,24] NaOCl, which acts by disrupting many vital functions in microbial cells, is a potent antimicrobial agent even when used at 0.5% concentration. Although the use of NaOCl appears to be in the range of 1-5% concentration[25], it is toxic in case of its extruding into periapical tissues. Especially due to the risk of damaging the permanent tooth follicle, peripheral tissues and oral mucosa[24] it is mostly recommended to use 1% concentration in primary teeth.[25] However, due to its limited effects in smear layer removal, it has been suggested that NaOCl should be combined with EDTA.[3,8,23,24] EDTA, which effectively removes the inorganic part of the smear layer, may cause the excessive removal of the peritubular and intratubular dentin and erosive defects as a result of prolonged exposure with the dentinal surfaces.[2,6,8,26] Although 17% concentrations of EDTA are also used in some primary teeth studies,[3,12,23] it was also observed the use of 10% and 14% forms.[2,5,6] Also, the erosive potential of even 10% EDTA in addition to 17% concentrations has been determined in primary teeth.[2,6] Indeed, Demirel *et al.*[6] reported that the safer acids/irrigation protocols should be used due to erosive effects of EDTA even with 10% use. Therefore, in this study, it was aimed to investigate the uses of EDTA at concentrations less than 17% and 10%.

In the literature, there is limited information about the use of EDTA <10% diluations in primary teeth. Therefore, in this study, in addition to 17% and 10% EDTA, 5% EDTA was also included to the study procedures, with the prediction that the use of <10% EDTA will reduce the erosive defects and offer the clinician safety use.

It is known that the root canal morphology are quite variable especially in primary molars, and exist numerous ramifications, accessory and lateral canals and branches.[14,20-22,27] In order to ensure that the

mentioned variations do not affect the results and to provide the standardization, the use of single rooted upper primary incisors was preferred in the present study. In addition, the increasing opening/widening of apical foramen with physiological root resorption[28] and the inaccessibility problems to apical region are observed in primary teeth.[2,5,6] These conditions of the apical region create differences in smear layer removal efficiency in apical third. Therefore, as in the other studies[2,6,10,16,23] the internal root surfaces were evaluated in 3 separate sections as coronal, middle third and apical in the present study.

As a result of the present study, in coronal third of the roots, the statistically significant differences were not found between all the irrigation groups. However, EDTA groups was found to be more effective than NaOCl in smear layer removal according to smear removal scores. Hariharan *et al.*[2] reported that 10% EDTA+5.25% NaOCl removed the smear layer more effectively than 5.25% NaOCl. Similarly, Demirel *et al.*[6] reported that 10% EDTA + 1% NaOCl group was superior than 1% NaOCl in smear layer removal. However, the authors reported that the statistical difference was observed in coronal third, in contrast to the present study. Also, Ximenes *et al.* [23], stated that there was no statistical difference between 17% EDTA+1% NaOCl irrigation and 1% NaOCl in coronal third similar to present study. However, authors emphasized that 17% EDTA+1% NaOCl solution could not remove the smear layer effectively and the dentinal tubules were not always visible. On the other hand, EDTA solutions causes erosive defects in inner dentinal surfaces of the roots.[2,6] Hariharan *et al.*[2] reported that in 10% EDTA+5.25% NaOCl irrigation, erosion of peritubular dentin, and break down in intertubular dentin and conjugation of dentinal tubules were detected in coronal thirds. Similarly, Demirel *et al.*[6] reported that erosive defects were observed in coronal third in 10% EDTA+1% NaOCl protocol. In the present study, erosive defects were observed in 10% and 17% EDTA groups, more in 17% in coronal third. However, erosive defects or excessive removal of intra/peritubular dentin were not observed in 5% EDTA and 1% NaOCl groups. Therefore, based on obtained results, It is possible to recommend the use of 5% EDTA, which is as effective as NaOCl and other EDTA groups in terms of smear removal efficiency and which might considered to be safer due to its less erosive defects potential on the root surfaces.

In the middle third of the roots, 17% EDTA group was superior than 1% NaOCl with statistical significance in smear layer removal ($p<0.05$). On the other hand, EDTA groups was found to be more effective than NaOCl according to smear layer removal scores. Hariharan *et al.*[2] and Demirel *et al.*[6] reported that the use of 10% EDTA+5.25% NaOCl and 10% EDTA+1% NaOCl, respectively, removed the smear layer more effectively than single use of NaOCl in the middle third. Also, Toyota *et al.*[5] reported that 14% EDTA removed the smear layer more effectively than 5% NaOCl in middle third. Similar to the coronal third, erosive defects and excessive removal of inter/peritubular dentin were most observed in 17% EDTA and 10% EDTA groups (more in 17%), respectively, but not observed in 5% EDTA and %1 NaOCl groups in the present study. Toyota *et al.*[5] reported that severe erosion of the intertubular and peritubular dentin was detected in the use of 14% EDTA in middle third. The authors also reported that erosive defects were increased by the ultrasonic equipments which the irrigation solution was activated for to be more effective to the dentin surfaces. However, Pitoni *et al.*[3] reported that 17% EDTA+1% NaOCl removed the smear layer more effectively than 1% NaOCl, but not emphasized that any signs of erosion on the root surfaces. Hariharan *et al.*[2] and Demirel *et al.*[6] reported that the findings of the erosive defects were observed in the middle third as in the coronal, in 10% EDTA+5.25% NaOCl and 10% EDTA+1% NaOCl irrigations, respectively. As with the coronal third, it is possible to recommend the use of 5% EDTA, which is as effective as NaOCl and other EDTA groups in terms of smear removal efficiency and is safer due to its less erosive defects potential.

In apical thirds, although EDTA groups removed the smear layer more effectively than NaOCl, no statistically significant difference was observed between the groups. In other studies mentioned above[2,6], it has been stated that EDTA solutions have more effective scores than NaOCl in

smear layer removal. Similar to the findings of this study, Toyota *et al.*[5] reported that although the findings related more effective smear removal scores in the use of 14% EDTA, significant difference was not observed between 14% EDTA and 5% NaOCl at apical third. In this study, it was observed that the smear layer removal scores were higher (lower smear layer removal efficiency) in apical thirds in all irrigation groups. This finding was attributed to irrigation agent did not reach the apical, since the needle tip was positioned 2 mm more coronally than the apex and the solution was applied with the limited pressure due to avoiding the extrusion into periapical area. Moreover, no erosive defect or excessive dentin removal was found in apical, which was attributed to the inaccessibility of the irrigation solution to the apical dentinal walls for above-mentioned reasons, regardless of the irrigation material. In apical third, it may be beneficial to recommend the use of 5% EDTA due to avoiding the extrusion of the material into periapical tissues and providing periapical safety.

The another finding of this study is that the removal efficiency of the smear layer in apical third was significantly lower compared to coronal third in use of 1% NaOCl, 10% and 17% EDTA groups. Lower smear layer removal efficiency has been attributed to reaching problems of the irrigants to apical region, therefore, the use of special needles (with lateral opening) or ultrasonic irrigation systems that provide better access to the apical can be recommended.[5] In this regard, it has been reported that ultrasonic generators are more effective than conventional needle irrigations.[29] Toyota *et al.*[5] reported that the use of ultrasonic equipment in 14% EDTA irrigation resulted in statistical difference in smear layer removal efficacy in the apical portion of the primary teeth. However, the authors also reported that the erosive defects were increased by using an ultrasonic generator.

Additionally, there are more organic materials and water in dentin structure of primary teeth than in permanent teeth, resulting in decreasing of hardness.[5] Therefore, dentin structure of primary teeth is more reactive to chemical irrigants and medicaments than permanent teeth dentin.[5,30] These mentioned differences cause the smear layer to be removed more easily in primary teeth than permanent teeth. However, this increases the possibility of erosive potential risk in the root dentin of primary teeth.[5] In this regard, it has been reported that dentinal loss caused by erosion weakens the root structure even in permanent teeth, therefore, all the care should be taken in the use of EDTA in primary teeth.[5,26,31] Moreover, it will be safer to use lower concentrations of irrigants, due to their toxic effects in case of extrusion to the periapical area and erosive potentials on dentinal surfaces as the concentrations of irrigants increase. On the other hand, considering the toxicity of the irrigation materials, the use of EDTA is more appropriate option than preferring NaOCl. Indeed, Botton *et al.*[32] reported that in primary teeth pulpectomies, even a high EDTA concentration such as 17% EDTA+1% NaOCl provides more cell viability and lower toxicity than 1% NaOCl. Therefore, based on both the results of this study and the conditions discussed above, it may be more appropriate to recommend the use of EDTA in primary teeth dentin due to the fact less toxicity compared to NaOCl and its superior efficacy in smear removal. However, due to the destructive erosive effect of the increasing concentrations of EDTA on root canal dentin and the potential risk of toxicity, especially due to increasing apical opening due to physiological root resorption process in primary teeth, the use of 5% EDTA -which removes the smear layer with the same efficacy compared to other higher EDTA concentrations and has less erosive potential- may be recommended.

CONCLUSIONS

Within the limitations of the present in-vitro study, it is possible to recommend "5% EDTA+1% NaOCl" protocol in primary teeth pulpectomies due to smear layer removal performance as effectively as other EDTA solution groups. Moreever, this irrigation protocol should be preferred due to less erosive defect in root dentin surface compared to high concentrations of EDTA groups and due to its safety use because of its low concentration in case of extrusion to the periapical area. In addition, further clinical studies are required to verify the results obtained in the present study and investigate the effectiveness of special

needles and ultrasonic systems to increase the reaching of irrigants to apical region.

ACKNOWLEDGEMENTS

The author would like to thank Prof.Dr.Şaziye Sarı for her precious contributions to the present study and thank to Assoc.Prof.Dr.Salih Doğan for his valuable technical assistance.

CONFLICTS OF INTEREST STATEMENT

No potential conflict of interest was reported by the author.

Süt Dişlerinde Farklı EDTA Konsantrasyonlarının Smear Tabakasını Uzaklaştırma Etkinliği: Bir SEM Çalışması

ÖZ

Amaç: *Bu çalışma farklı konsantrasyonlardaki etilendiamin tetraasetik asitin (EDTA), süt dişlerinde smear tabakasının uzaklaştırılmasına olan etkilerini tarama elektron mikroskopu (TEM) ile değerlendirmeyi amaçlamaktadır.* ***Gereç ve Yöntemler:*** *Bu çalışma 28 adet çekilmiş üst süt kesici diş ile gerçekleştirilmiş ve bu dişler %5, %10, %17 EDTA ve %1 sodyum hipoklorit (NaOCl) olacak şekilde dört ana gruba (n=7) atanmıştır. Kök kanal irrigasyon prosedürlerinin ardından, kök kanal yüzeyleri (koronal, orta ve apikal) SEM ile taranmış ve smear tabakası uzaklaştırma skorları kaydedilmiş ve karşılaştırılmıştır. Sonuçlar Kruskal–Wallis, Friedman ve Dunn testleri kullanılarak analiz edilmiştir.* ***Bulgular:*** *Tüm kök bölümlerinde, EDTA gruplarının smear tabakasını NaOCl'den daha efektif uzaklaştırmasına rağmen, sadece orta üçlüde %17 EDTA ile %1 NaOCl arasında istatistiksel anlamlı fark gözlenmiştir (p<0,05). Smear tabakası, birçok grupta (%10 EDTA, %17 EDTA ve %1 NaOCl) koronalde apikale göre daha efektif uzaklaştırılmıştır (p<0,05). Eroziv defektler en çok %17 EDTA, daha az olarak da %10 EDTA grubunda görülmüş ve bu bulgulara %5 EDTA ve %1 NaOCl gruplarında saptanmamıştır.* ***Sonuç:*** *Smear tabakası uzaklaştırılmasında, NaOCl ve yüksek konsantrasyondaki EDTA grupları ile benzer etkinlik sunması, düşük eroziv potansiyeli ve periapikal güvenlik için düşük konsantrasyonu nedeniyle süt dişi kanal tedavilerinde irrigasyon solüsyonu olarak %5 EDTA kullanımını önermek mümkündür.* ***Anahtar Kelimeler:*** *EDTA, kök kanalı sulayıcıları, smear tabakası.*

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