

Assessment of Endodontic Emergency Care in a COVID-19 Pandemic

COVID-19 Pandemisinde Endodontik Acil Bakımın Değerlendirilmesi

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Abstract

Objective: This study compared the aerosol-generating and non-aerosol-generating endodontic emergency procedures' success and assessed the outcome of endodontic treatments initiated before a pandemic but could not be completed in the targeted time.

Materials and Methods: Emergency treatments were performed according to symptoms of teeth. Treatment success or failure was determined according to patients whether not re-referral with untimely pain. Short-term outcome and complications arising from teeth, which endodontic treatments were prolonged were also recorded. A chi-square test was used in the statistical analysis, and $p < 0.05$ was considered significant.

Results: The aerosol-generating procedure group's success rate was 86.2%, while it was 70.0% in the non-aerosol generating procedure group ($p = 0.050$). The short-term survival rate of teeth was 83.7% in patients whose endodontic treatment had been prolonged.

Conclusion: Considering the pros and cons, each emergency patient should be evaluated case-by-case.

Öz

Amaç: Bu çalışmada, aerosol oluşturan ve aerosol oluşturmeyen endodontik acil prosedürlerin başarısı karşılaştırıldı ve pandemi öncesi başlatılan ancak hedeflenen sürede tamamlanamayan endodontik tedavilerin sonuçları değerlendirildi.

Gereç ve Yöntemler: Dişlerin semptomlarına göre acil tedavileri uygulandı. Tedavi başarısı veya başarısızlığı hastaların ağrı ile tekrar başvurup başvurmamasına göre belirlendi. Endodontik tedavileri uzamış dişlerde kısa dönem sonuçları ve komplikasyonlar da kaydedildi. İstatistiksel analizde ki-kare testi kullanıldı ve $p < 0,05$ anlamlı kabul edildi.

Bulgular: Aerosol oluşturan prosedürler grubunun başarı oranı %86,2 iken, aerosol oluşturmeyen prosedürler grubunda bu oran %70,0 idi ($p = 0,050$). Endodontik tedavisinin tamamlanma süreci uzamış hastalarda kısa süreli diş sağkalım oranı %83,7 idi.

Sonuç: Artıları ve eksileri göz önünde bulundurularak her acil hasta, olgu bazında değerlendirilmelidir.

Keywords

Aerosols, SARS-CoV-2, emergencies, endodontics, pulpitis

Anahtar Kelimeler

Aerosoller, SARS-CoV-2, aciller, endodonti, pulpit

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Introduction

The coronavirus disease 2019 (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has become a worldwide health problem in a short time and restricted

social life (1,2). SARS-CoV-2 enters the body through the respiratory system, and its interpersonal transmission occurs mainly through droplets generated when talking, coughing or sneezing (3,4). Other transmission routes have also been reported, such as aerosol, fecal-oral, and indirect transmission. Aerosols are in a diameter of less than 5 mm, while respiratory droplets are >5-10 mm in diameter (5). "The virus can stay in aerosols for hours and on multiple surfaces for days under laboratory conditions" (6). Most dental procedures pose a high contagion risk for dentists, patients, and auxiliary staff due to aerosol/droplet production and instrument contamination (7). Considering the risk of exposure for different work categories, dentists are at the greatest risk of coronavirus (8). While the first COVID-19 case in Turkey was seen on March 10, 2020, the World Health Organization declared a pandemic outbreak on March 11, 2020 (9). The Turkish Ministry of Health recommended solely performing emergency treatments and postponing non-urgent dental procedures on March 17, 2020 (10). The Turkish Dental Association (TDA) also recommended avoiding and minimizing aerosol-generating dental procedures (11).

On June 1, 2020, the Turkish Ministry of Health published "Guide on Working in Healthcare Institutions During the Normalization Period in COVID-19 Pandemic", and our dental polyclinic has adapted to the normalization process until June 15, 2020 (12).

Between these dates, considering the emergency care definition and recommendations of TDA, only emergency dental care was provided to the patients. Some patients who applied with the need for endodontic treatment received palliative treatment (prescription of drugs or temporary restoration) to avoid the aerosol generation as recommended (11). However, in some cases, it was almost impossible to avoid aerosols in the emergency intervention of severe toothache caused by pulp inflammation or acute apical abscess, which we frequently encounter in the endodontics clinic. We aimed to compare the success of aerosolized and non-aerosolized endodontic emergency procedures and to evaluate the short-term results of delayed endodontic treatments.

Materials and Methods

This study was approved by Medical Ethics Committee of Başkent University (project no:

D-KA20/42, date: 22.12.2020) and the Turkish Ministry of Health's approval were taken following the Declaration of Helsinki. All clinical data of the patients who called or visited the dental polyclinic of Başkent University Adana Dr. Turgut Noyan Healthcare Center between March 17 and June 15, 2020, were collected. The patients referred to the endodontics clinic were selected and categorized as follows:

1) Treatment postponement was recommended in cases with at least one asymptomatic tooth needing endodontic treatment (n=149).

2) In cases with at least one tooth with mild symptoms that need endodontic treatment, non-aerosol-generating procedures (n=65) were performed. These procedures involved restoring a cavitated tooth with a sedative temporary filling (zinc oxide-eugenol cement; Cavex Holland BV, Haarlem, Netherlands) and prescribing analgesics and/or antibiotics in appropriate cases (Figure 1). The position statements of the international endodontic societies have been followed in the prescription for specific cases (13-15).

3) In cases with severe and spontaneous pain either with vital pulp, non-vital pulp or previous root canal filling, aerosol-generating procedures (n=65) were performed. In these cases, calcium hydroxide medication and temporary tooth restoration were applied after chemomechanical cleaning of the root canal system under local anaesthesia.

Only patients who had no symptoms related to COVID-19 and revealed no history of international travel or suspicious contact were referred. Before treatment, all patients read and signed the informed consent forms.

Patients' fever was measured prior to treatment, and they rinsed with 0.2% povidone-iodine. Six dentists and their assistants in the endodontics clinic

Pain Management by Prescription	
Vital Cases	Ibuprofen 600mg + Acetaminophen 325- 500mg
Non-vital Cases	<ul style="list-style-type: none"> Amoxicillin with clavulanic acid b.i.d. 500-875 mg x 3-7 days/ Clindamycin 300mg q.i.d. x 3-7 days Ibuprofen 600mg + Acetaminophen 325-500mg

Figure 1. Prescription procedure of analgesics, and/or antibiotics

used personal protection equipment (FPP3 mask, face shield, bonnet, gloves, protective clothing and rubber-dam isolation in aerosol-generating procedures) as recommended. During this period, there was no COVID-19 transmission to dental staff in our clinic, and antibody tests performed in our hospital during July were negative.

“Success” in both emergency procedures was defined as relief of pain and no need for additional intervention until the organized appointment during the normalization process. “Failure” in non-aerosol-generating procedures was defined as the need for an additional aerosol-generating procedure or the tooth having to be extracted due to the treatment process’s prolongation.

“Failure” in aerosol-generating procedures was defined as the patient referring again with symptoms such as pain, swelling, or the tooth’s extraction due to the prolongation of the treatment process.

“Follow-up” for both emergency procedures was defined as coming to our clinic to complete the relevant tooth’s treatment during the normalization period.

The outcome of teeth which endodontic treatment was initiated in our clinic before March 17, 2020; however, it could not be completed due to the restriction of dental procedures only to emergency care was included in the present study. Complications arising from prolonging these patients’ treatment process who came to their appointments to complete their treatment during the normalization period were evaluated. These complications were classified as loss of temporary filling, tooth fracture, flare-up and need for emergency treatment and tooth extraction. The success of endodontic treatment was defined as

the accomplishment of root canal filling and coronal restoration.

Statistical Analysis

IBM SPSS Statistics Version 20.0 software was used in the statistical analyses. Categorical variables were described as numbers and percentages, whereas continuous variables were expressed as mean, standard deviation, median and minimum-maximum where appropriate. A chi-square test was used in the comparison of categorical variables. The statistical level of significance for all tests was considered to be 0.05.

Results

Demographics

The demographics of 2,574 patient attendance according to the departments were presented in Figure 2. The patients who called our clinic by phone were advised to come only for emergencies. Three on-duty dentists who changed every day examined the patients who visited the clinic. Patients were directed to the relevant departments according to their primary dental complaints or needs. A total of 279 patients were referred to the endodontics clinic. While 149 patients were recommended to postpone their treatment, the remaining 130 patients received endodontic emergency treatment with or without aerosol by six dentists. There was no application to the endodontics clinic with a history of trauma.

Attendance to Endodontics Clinics

Sixty seven teeth of 65 patients (28 male, 37 female patients; mean age 35 ± 12.2 years, age range: 11-68 years) were treated with non-aerosol generating procedures. However, 27 patients did not apply to our clinic again after the procedure. They were excluded

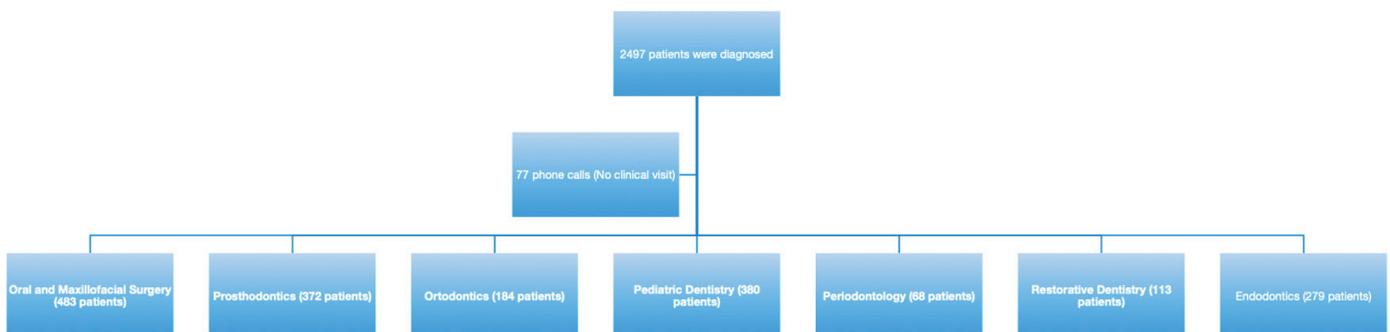


Figure 2. Demographics of the patient attendance according to the departments

from the evaluation in terms of success criteria because of the lack of follow-up data. Table 1 shows the detailed data of patients undergoing non-aerosol generating procedures.

Treatment of 58 in 65 patients (29 male, 36 female patients; mean age: 35.7±13 years, age range: 11-66 years) with aerosol-generating procedures was continued in our clinic and included in the success evaluation because the follow-up information was complete. Data of aerosolized procedures are summarized in Table 2. The aerosol-generating procedures group's success rate is 86.2%, while it is 70.0% in the non-aerosol-generating procedures group. Also, the rate of those followed up after the aerosol-generating procedures is 89.2%, while 59.7% in the non-aerosol-generating procedures group. A

Table 1. Patient gender, age, tooth type, intervention, follow-up, duration to actual treatment, vitality and outcome/success rates for each patient received non-aerosol generating emergency procedures

Gender	
Female	37
Male	28
Age	Mean: 35±12.2 years Range: 11-68 years
Tooth type (n=67)	
Maxillary molar	22
Mandibular molar	20
Maxillary premolar	10
Mandibular premolar	6
Maxillary anterior	7
Mandibular anterior	2
Intervention	
Prescription	27
Temporary restoration	39
Prescription + temporary restoration	1
Follow-up	
Yes	40 (59.70%)
No	27 (40.29%)
Duration to actual treatment (days)	78.38±73.370 days Range: 2-271 days
Vitality	
Vital pulp	48 (71.64%)
Non-vital pulp	17 (35.41%)
Root-filled teeth	2 (2.98%)
Outcome/Success rates	
Overall	70%
Vital pulp	67.74%
Non-vital pulp and root filled teeth	77.77%

significant difference was found between emergency procedures in achieving the continuation of the treatment ($p=0.001$) and the success of delaying endodontic treatment by relieving pain ($p=0.050$, marginal significance).

There was no significant difference between the success rates of non-aerosol-generating procedures' subgroups ($p>0.999$); since the temporary restoration success rate was 68.0% and 71.4% in the prescribed group.

Besides, endodontic treatment of 37 teeth belonging to 34 patients (10 male, 24 female patients; mean age: 36.4±17 years, age range: 15-88 years) was initiated in our clinic before the pandemic and was prolonged in this period. Complications experienced during this period can be listed as follows: 3 patients had a temporary filling fracture, one patient came with a sinus tract, one patient had a flare-up, two patients were referred to a surgeon for extraction by fracture of teeth, and four patients did not want to complete their treatment due to the pandemic (Table

Table 2. Patient gender, age, tooth type, follow-up, duration to actual treatment, vitality and untimely presence of pain for each patient received aerosol generating emergency procedures

Gender	
Female	36
Male	29
Age	Mean: 35.7±13 years Range: 11-66 years
Tooth type (n=65)	
Maxillary molar	22
Mandibular molar	16
Maxillary premolar	12
Mandibular premolar	8
Maxillary anterior	4
Mandibular anterior	3
Follow-up	
Yes	58 (89.23%)
No	7 (10.76%)
Duration to actual treatment (days)	57.47±34.15 days Range: 24-148 days
Vitality	
Vital pulp	43 (66.15%)
Non-vital pulp	21 (32.30%)
Root-filled teeth	1 (1.53%)
Untimely presence of pain	
Overall	86.2%
Vital pulp	89.18%
Non-vital pulp and root filled teeth	80.95%

3). As a result, the treatment of 31 teeth (83.7%) of 28 patients (82.4%) whose endodontic treatment had been prolonged was completed in an average of 116.6 ± 58 days.

Discussion

With the COVID-19 pandemic, our standard treatment concept will never be the same in dentistry as in other areas. While COVID-19 spread rapidly all over the world, dental practices were restricted as a caution. So, we performed only emergency interventions as recommended during the restriction period in different countries worldwide.

We primarily aimed to compare the efficacy of different endodontic emergency interventions in pain relief and delaying treatment. Aerosolized emergency procedures were significantly more successful than aerosol-free ones in relieving the

pain and gaining time for endodontic treatment. As expected, a high success rate of 89.19% was achieved in pain relief by removing the pulp completely with aerosol-generating procedures in vital cases. In comparison, only a 67.75% success rate was achieved with non-aerosol-generating procedures. Also, the motivation of patients who underwent aerosol-generating procedures to continue their treatment was significantly higher. This result may be related to patients' fear of pain recurrence with the involved teeth. Patients experiencing severe pain during the pandemic lockdown for any dental treatment may worry about a possible lockdown again and request their treatment to be completed as soon as possible (16). Patel et al. (17) reported a follow-up rate of 96% and a success rate of 83% for aerosol-free endodontic interventions in a total of 21 patients. However, we observed a 70% success and 59.7% follow-up rate with non-aerosol-generating endodontic emergency procedures. The difference between follow-up rates may be due to methodological differences. Patel et al. (17) followed their patients by telephone questionnaire, while we ranked the continued endodontic treatment of the relevant tooth in our clinic as a follow-up. The difference between success rates may be related to many factors, such as differences in clinicians' diagnostic experience and communities' health-seeking behaviour.

Starting from the normalization period, we could complete endodontic treatment and restoration of 31 teeth (an 83.78% success rate) in a total of 37 teeth, similar to Patel et al.'s (17) study reporting an 83.87% success rate. Although some complications occurred, like temporary restoration fracture, presence of a sinus tract and flare-up, these cases were rated as successful since they were managed appropriately. Two extraction and four uncomplete treatment cases were ranked as failures. In one extraction case, the patient came with swelling five months later and was cleaned and dressed with calcium hydroxide again; however, the tooth had to be extracted after three months due to fracture. In the other case, the patient came with a restorable fracture three months after the root canal treatment was started; however, the patient resorted to extraction with her willingness since she did not want the process to be longer. Endodontically treated teeth might fracture due to several factors, such as weakening the tooth structure

Table 3. Patient gender, age, tooth type, presence of adverse event, time elapsed to treatment completion, vitality and outcome/success rates for each patient received prolonged endodontic treatment

Gender	
Female	24
Male	10
Age	Mean: 36.4±17 years Range: 15-88 years
Tooth type (n=37)	
Maxillary molar	14
Mandibular molar	11
Maxillary premolar	2
Mandibular premolar	1
Maxillary anterior	8
Mandibular anterior	1
Presence of adverse event	
Fractured temporary restoration	3
Refused to complete treatment	4
Pain-flare up	1
Extraction	2
Came with sinus tract	1
No adverse event	26
Time elapsed to treatment completion (days)	Mean: 116.68±58.01 days Range: 29-319 days
Vitality	
Vital pulp	15 (40.54%)
Non-vital pulp	16 (43.24%)
Root-filled teeth	6 (16.21%)
Outcome/success rates	
Overall	83.78%
Vital pulp	86.66%
Non-vital pulp and root filled teeth	81.81%

by endodontic access cavity and chemomechanical preparation of the root canal (18-20).

Additionally, the risk of re-contamination of the root canal system via the temporary restoration can be considered another important adverse event for prolonged endodontic treatment (21). Temporary restorations can allow microorganisms into the root canal system since they cannot provide sufficient sealing for a long time and lead to the formation of microcracks (22,23). Our findings showed that exposure to calcium hydroxide and staying with a temporary filling averagely of 16 weeks in prolonged treatments and eight weeks in aerosolized interventions did not significantly raise these detrimental events, with success rates of 83.78% and 86.2%, respectively. Similarly, a recent study suggested that calcium hydroxide could be considered a suitable interappointment medicament which also may be associated with a predictable outcome (24).

In our clinic, decision-making in endodontic emergency procedures was based on the symptoms of the teeth. In cases with mild symptoms, non-aerosol generating procedures were preferred. In vital cases with cavitation, a temporary filling was preferred to sedatize the tooth and rule out food impaction pain. Analgesics were prescribed for vital teeth that cannot be filled temporarily without aerosolized procedures. In non-vital cases, if the pain was predicted to be due to food impaction, a temporary filling was placed, whereas if the pain was suspected to be caused by infection, analgesics and/or antibiotics were prescribed following the published guidelines. Our clinical records about the pulpal and periapical health status of the teeth was described with vitality, which can be considered a limitation.

Conclusions

Within this retrospective study's limitations, aerosolized endodontic emergency procedures presented more success in pain relief, gaining time for actual treatment with a significantly higher follow-up rate than non-aerosolized procedures. Even so, non-aerosolized endodontic procedures have reduced symptoms to an acceptable level for 70% of patients and postponed the actual treatment for approximately 11 weeks. Additionally, prolonging endodontic treatment with long-term calcium hydroxide dressing does not seem to affect the short-

term survival of teeth. Our results may aid clinicians in treatment planning and patient triage in a possible restriction in dental procedures.

Considering the success rates of the treatments reported in the literature, evaluating emergency patients case-by-case with clinical judgment and decision-making is recommended.

Ethics

Ethics Committee Approval: This study was approved by Medical Ethics Committee of Başkent University (project no: D-KA20/42, date: 22.12.2020) and the Turkish Ministry of Health's approval were taken following the Declaration of Helsinki.

Informed Consent: Before treatment, all patients read and signed the informed consent forms.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Concept: S.N.S., C.K., C.E.S., K.G., Design: S.N.S., C.K., C.E.S., K.G., Data Collection or Processing: S.N.S., Analysis or Interpretation: C.E.S., Literature Search: S.N.S., C.K., Writing: S.N.S., C.K., K.G.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Lu H, Stratton CW, Tang YW. Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. *J Med Virol* 2020; 92: 401-2.
2. Cascella M, Rajnik M, Aleem A, Dulebohn SC, Di Napoli R. Features, Evaluation, and Treatment of Coronavirus (COVID-19) [Updated 2022 Oct 13]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-.
3. Peng X, Xu X, Li Y, Cheng L, Zhou X, Ren B. Transmission routes of 2019-nCoV and controls in dental practice. *Int J Oral Sci* 2020; 12: 9.
4. Lu CW, Liu XF, Jia ZF. 2019-nCoV transmission through the ocular surface must not be ignored. *Lancet* 2020; 395: e39.
5. World Health Organization. Modes of transmission of virus causing COVID-19: Implications for IPC precaution recommendations. (cited 2020 December 13) Available from: <https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations>.
6. Interim Infection Prevention and Control Recommendations for Healthcare Personnel During the Coronavirus Disease 2019 (COVID-19) Pandemic (cited 2022 December 22) Available from:

- https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html#anchor_1604360679150
7. Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. *J Hosp Infect* 2020; 104: 246-51.
 8. Izzetti R, Nisi M, Gabriele M, Graziani F. COVID-19 Transmission in Dental Practice: Brief Review of Preventive Measures in Italy. *J Dent Res* 2020; 99: 1030-8.
 9. Coronavirus disease 2019 (COVID-19): situation report, 67. (cited 2021 March 10) Available from: <https://apps.who.int/iris/handle/10665/331613>.
 10. Postponement of Elective Transactions and Other Measures to be Taken. (cited 2020 December 13) Available from: <https://shgmhastahakdb.saglik.gov.tr/TR,64508/elektif-islemler-in-ertelenmesi-ve-diger-alinacak-tedbirler.html>.
 11. Dişhekimiğinde Acil Durum ve Acil Servis İhtiyacı İçin Durum Yönetimi Rehberi. (cited 2020 December 13) Available from: http://www.tdb.org.tr/tdb/v2/yayinlar/Cesitli/Covid_Doneminde_Acil_Durum_Yonetimi_Rehberi_06.pdf.
 12. Krithikadatta J, Nawal RR, Amalavathy K, McLean W, Gopikrishna V. Endodontic and dental practice during COVID-19 pandemic: Position statement from the Indian Endodontic Society, Indian Dental Association, and International Federation of Endodontic Associations. *Endodontology* 2020; 32: 55-66.
 13. Endodontic and Dental Practice during COVID-19 Pandemic: Position Statement from International Federation of Endodontic Associations (IFEA) & Indian Endodontic Society (IES). (cited 2020 December 13) Available from: http://www.aede.info/pdf/newsletters/IFEA_IES_Endodontic_and_Dental_Practice_during_COVID-19.pdf.
 14. Segura-Egea JJ, Gould K, Şen BH, Jonasson P, Cotti E, Mazzoni A, et al. European Society of Endodontology position statement: the use of antibiotics in endodontics. *Int Endod J* 2018; 51: 20-5.
 15. AAE Position Statement: AAE Guidance on the Use of Systemic Antibiotics in Endodontics. *J Endod* 2017; 43: 1409-13.
 16. Guo H, Zhou Y, Liu X, Tan J. The impact of the COVID-19 epidemic on the utilization of emergency dental services. *J Dent Sci* 2020; 15: 564-7.
 17. Patel B, Eskander MA, Ruparel NB. To Drill or Not to Drill: Management of Endodontic Emergencies and In-Process Patients during the COVID-19 Pandemic. *J Endod* 2020; 46: 1559-69.
 18. Silva EJNL, Rover G, Belladonna FG, De-Deus G, da Silveira Teixeira C, da Silva Fidalgo TK. Impact of contracted endodontic cavities on fracture resistance of endodontically treated teeth: a systematic review of in vitro studies. *Clin Oral Investig* 2018; 22: 109-18.
 19. Sabeti M, Kazem M, Dianat O, Bahrololumi N, Beglou A, Rahimpour K, et al. Impact of Access Cavity Design and Root Canal Taper on Fracture Resistance of Endodontically Treated Teeth: An Ex Vivo Investigation. *J Endod* 2018; 44: 1402-6.
 20. Uzunoglu E, Yilmaz Z, Erdogan O, Görduysus M. Final Irrigation Regimens Affect Fracture Resistance Values of Root-filled Teeth. *J Endod* 2016; 42: 493-5.
 21. Naoum HJ, Chandler NP. Temporization for endodontics. *Int Endod J* 2002; 35:964-78.
 22. Madarati A, Rekab MS, Watts DC, Qualtrough A. Time-dependence of coronal seal of temporary materials used in endodontics. *Aust Endod J* 2008; 34: 89-93.
 23. Jamleh A, Mansour A, Taqi D, Moussa H, Tamimi F. Microcomputed tomography assessment of microcracks following temporary filling placement. *Clin Oral Investig* 2020; 24: 1387-93.
 24. Best S, Ammons CL, Karunanayake GA, Saemundsson SR, Tawil PZ. Outcome Assessment of Teeth with Necrotic Pulp and Apical Periodontitis Treated with Long-term Calcium Hydroxide. *J Endod* 2021; 47: 11-8.