How to Cite:
Hussaen, M. N., Abbas, S. M. J., & Rahoomi, M. H. (2022). Evaluation of the effect of three different base endodontic sealers on the periapical region's discomfort and healing after root canal therapy. *International Journal of Health Sciences*, *6*(S8), 2025–2034. https://doi.org/10.53730/ijhs.v6nS8.12384

Evaluation of the effect of three different base endodontic sealers on the periapical region's discomfort and healing after root canal therapy

Dr. Mohammed Noori Hussaen
B.D.S. H.D.D. cons., Almaghribspecialized dental center, Iraq
Corresponding author email: sarmed91@yahoo.co.uk

Dr. Shatha Mohammed Jawad Abbas
B.D.S. H.D.D. cons., Almaghrib specialized dental center, Iraq
Email: Dr.shathamj@yahoo.com

Dr. Marwah Hameed Rahoomi
B.D.S. H.D.D. cons., Sheikh omar dental specialist center, Iraq
Email: Marwa.hameed87@yahoo.com

***Abstract*---**Seventy-five single-rooted teeth diagnosed with asymptomatic necrosis and apical periodontitis were randomly assigned to 3 experimental groups (n=25), according to the root canal sealer: MTA Fillapex, CPM Sealer, and AH Plus. Calcium hydroxide was employed as intracanal dressing throughout used during endodontic procedure. Classify each patient's discomfort as none, slight, moderate, or severe. Pain was rated between 1 and 4 after 24 hours, 48 hours, and 7 days. Also, analgesic use was monitored. The chi-square test contrasted postoperative pain and painkiller use. The ordinal (linear) chi-square test measured pain following therapy. There were no differences between groups in postoperative pain frequency, severity, or analgesic intake ($p>0.05$). After 7 days, no pain. Postoperative discomfort and the requirement for analgesics were the same for AH Plus, CPM Sealer, and MTA Fillapex. Aim of study: This clinical study was created to evaluate the frequency and intensity of pain with analgesic intake following root canal therapy utilizing various root canal sealers (MTA Fillapex, CPM Sealer, AH Plus).

***Keywords*---**MTA Fillapex, CPM sealer, AH plus, endodontic, sealers, root canal.

2026

Introduction

Root canal treatment is successful when the apical end of the canal is sealed fluid-tight. This prevents the buildup of irritants that might cause the attachment device to fail. Root canal sealants fill gaps and seal root canals during obturation, encapsulate remaining germs, and fill channel flaws. Each root canal sealer has its own advantages and limitations in endodontic therapy. Sealants are selected for sealing, adhesion, biocompatibility, and antibacterial resistance [1]. To be successful, endodontic treatment must seal the whole root canal space in three dimensions. Sealer and gutta-percha are used to plug root canals. Gutta-percha is biocompatible filler for radicular gaps. Since it merely fits the surrounding dentinal walls, it cannot ensure a tight root canal closure. Root canal sealant is used to fix irregularities between canal walls and gutta-percha [2].

Functions of a sealer

1. Sealer as Cement (luting/ Binding): In lateral condensation obturation, sealers bind gutta-percha cones to the dentinal wall.
2. Sealers are utilized to seal gaps between cones, irregularities in the root canal, and inaccessible sections of the root canal.
3. Sealers may affect host reactivity by interacting with the local tissue environment. Calcium hydroxide and MTA sealers are bioactive.
4. Sealers must suppress or restrict bacterial growth. Antibacterial sealants include zinc oxide eugenol, calcium hydroxide, and calcium silicate.
5. Sealers act as lubricants when employed with solid/semisolid obturation materials, allowing for easy seating in the apical region.
6. Sealants can also serve as a marker for root resorption, auxiliary canals, root fractures, and other locations the main core material may not reach, making clinical or radiological detection of these diseases easier [3],[4].

MTA Fillapex Root Canal Sealer (Angelus)

Produced MTA endodontic sealer. MTA, salicylate resin, natural resin, bismuth, and silica are in the mixture, according to the manufacturer. MTA Fillapex is the first paste-form MTA-based root canal sealant. It's waste-free, handles well, and sets up quickly [4]. It has antibacterial properties and low solubility (0.1%), so it doesn't degrade over time like other sealers, enabling germs to re-enter the canal. Due to its physicochemical qualities, it should only be used as an endodontic sealer. The material has an alkaline pH like sealers [5].

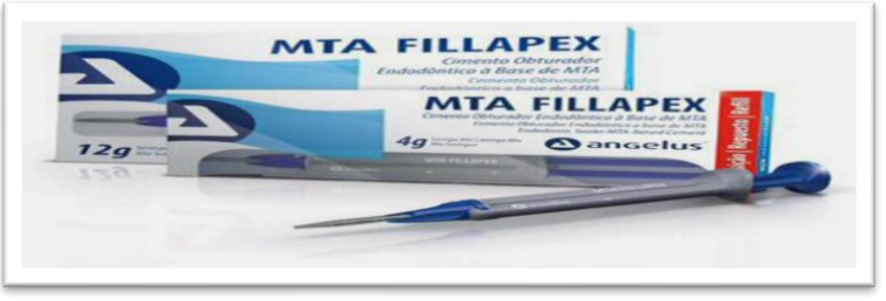

Figure (1): MTA Fillapex Sealer

CPM Sealer (EGEO SRL, MTM Argentina SA, Buenos Aires,Argentina)

CPM sealer was established in Argentina in 2004 to combine root canal sealer's sealing and physicochemical properties with MTA's biological properties. Hydrophilic powder particles form a colloidal gel when wet. The substance is mostly tricalcium silicate, oxide, aluminate, and silicate. A liquid solution is saline and calcium chloride. It hardens and seals in an hour [6]. It's radiopaque and antimicrobial. Fibroblast culture showed it's non-cytotoxic [5].

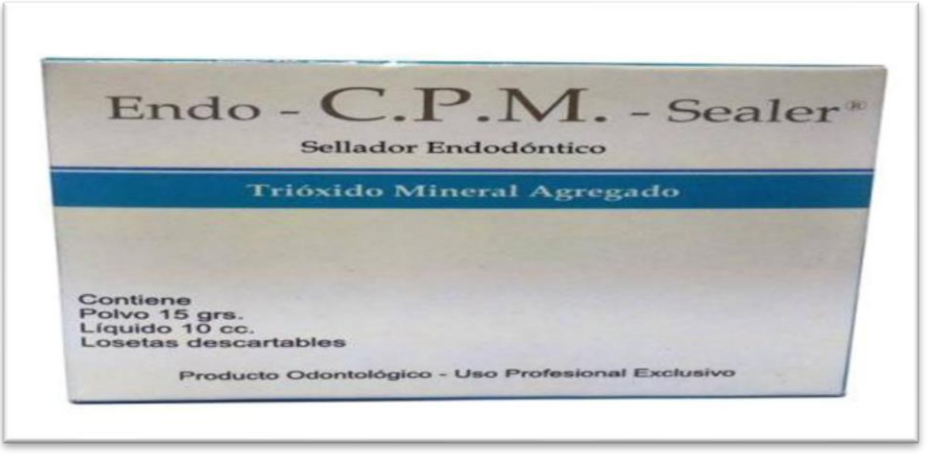

Figure (3): CPM root canal Sealer

AH Plus (DENTSPLY DeTrey)

AH-26 has been tweaked to produce less formaldehyde [7]. The sealing abilities of the AH-26 and AH Plus appear comparable [8]. Epoxy glue and amine are used to create the two-tube AH Plus system. Contrary to the diepoxide (bisphenol A diglycidyl ether) and fillers present in the epoxide paste tube, the primary monoamine, secondary diamine, disecondary diamine, silicone oil, and fillers make up the majority of the amine paste tube. It displays a four-hour workday [9].

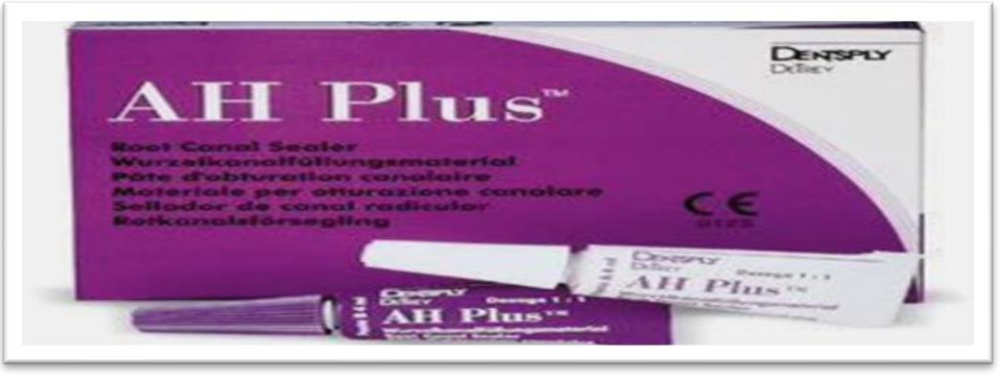

Figure (2) : AH Plus root canal sealer

Methodology

The sample size was determined using data from an earlier research [10]. It said that a sample size of 25 in each group was necessary, taking into account an alpha error of 0.05 and a power of 0.9,75 participants were included in the trial on the assumption of loss.

Exclusion criteria

Teeth that have had endodontic treatment in the past or have tested positive for pulpal sensitivity, a root fracture, teeth that couldn't be isolated with a rubber dam or whose root length couldn't be reached, and patients who have experienced problems receiving treatment in the past. Patients under the age of 20 who were pregnant or had uncontrolled systemic diseases were also disqualified.

Randomization and blinding

A database of randomly generated numbers by computers was used for stratified randomization (www.randomization.com). Allocation was concealed by numbered, opaque envelopes. When the endodontic sealer was going to be applied, uninvolved helpers opened the packets. Endodontic sealers were randomized for patients (MTA Fillapex, CPM and AH Plus).

Table 1:Describes endodontic sealers' makeup. Before filling the root canal, the operator understood which sealer to apply. Blinding patients to the sealant

sealers	composition
MTA Fillapex (Angelus, Londrina, Brazil)	Base Paste: Salicylate Resin, Natural Resin, Calcium Tungstate, Nanoparticulated Silica, Pigments. Catalyst Paste: Diluting Resin, Mineral Trioxide Aggregate, Nanoparticulated Silica, Pigments.
CPMsealer (EGEO S.R.L., Buenos Aires, Argentina)	the same composition of MTA except for the addition of barium sulfate and calcium chloride
AH Plus (Dentsply, DeTrey, Konstanz, Germany)	Paste A: Bisphenol-A epoxy resin, Bisphenol-F epoxy resin, calcium tungstate, zirconium oxide, silica and iron oxide pigments. Paste B: Dibenzyldiamine, aminoadamantane, tricyclodecane diamine, calcium tungstate, zirconium oxide, silica and silicone oil.

Tooth selection and preparation

Pulpal necrosis is identified by pulp chamber hemorrhage and a failed cold test. After local anesthesia (2 % lidocaine with epinephrine 1:100,000 - Nova DFL, Rio de Janeiro, Brazil), a spherical high-speed diamond bur was used to create an access cavity. After reaching the pulp chamber, a disinfectant-and-rubber-dam insert was produced. After 5 ml of 2.5% NaOCl irrigation, 10 K-file was used to explore root canals (DentsplyMaillefer, Ballaigues, Switzerland). Root canals were measured with a RomiApex A-15 (Romidan Dental Solution, Israel) and created

with Wave-one Gold files (DentsplyMaillefer, Ballaigues, Switzerland). Till working length, repeat. Instrumented root canals were irrigatedwith 5% EDTA for one minutes with ultrasonic activation. Rinse with 5 mL of 2.5% normal saline. Calcium hydroxide was then utilized to fill and seal root canals. After 7 days, infiltrative anesthesia and rubber dam isolation the Calcium hydroxide was removed using manual files, 2.5% NaOCl, Gutta-percha was used to fill root canals. The teeth were x-rayed to check the gutta-percha cone and fill the canal.Endodontic sealants were applied as prescribed.Then the teeth filled with composite restoration. Pain relief was 600 mg ibuprofen every 8 hours.

Result

The study comprised 75 teeth from 75 individuals, 51 anterior and 24 lower premolars, with a mean age of (20-55 years) (1.70±0.67) years. There were 41 women and 34 males in the study. As table 2.

Table 2: Baseline demographic and clinical features of patients in the study groups

Variable		MTA Fillapex	CPM sealer	AH Plus	p. value
Gender	Female	14	10	17	0.137
	male	11	15	8	
Age	< 30	13	8	10	0.485
	30-50	11	13	11	
	> 50	1	4	4	
Teeth	Anterior	18	15	18	0.576
	Premolar	7	10	7	

Table 3, summarizes the demographic and clinical characteristics of the research groups' subjects. After 24 hours, 14.6 % of the cases11 patients, [MTA Fillapex (Slight=2,Moderate=1, sever=0), CPM sealer (Slight=3, Moderate=1, sever=0),AH Plus (Slight=2, Moderate=2, sever=0)] had sever postoperative discomfort, with that percentage falling to 6.66%(5 patients) [MTA Fillapex (Slight=1, Moderate=0, sever=0), CPM sealer (Slight=2, Moderate=1, sever=0), AH Plus (Slight=1, Moderate=0, sever=0)] after 48 hours.

The results for the incidence and intensity of postoperative pain in each group 24 h and 48 h after treatment are shown in Table 3. No pain was reported after 7 days in any of the groups. No significant differences were detected among the groups either in incidence or intensity of postoperative pain or in analgesic intake, at any of the time points. Moreover, no significant association of patient- or tooth-related factors composing the regression analysis was found ($p > 0.05$).

Table 3: Incidence and intensity of postoperative pain in each group 24h and 48h after treatment

Sealer	24h				48h			
	No pain	Slight	Moderate	Sever	No pain	Slight	Moderate	Sever
MTA Fillapex	22	2	1	0	24	1	0	0

CPM sealer	21	3	1	0	22	2	1	0
AH Plus	21	2	2	0	24	1	0	0

Discussion

This randomized, controlled, and prospective clinical study assessed the effects of three root canal sealers—MTA Fillapex, CPM sealer, and AH Plus—on postoperative pain and analgesic use. According to the study, endodontic treatment had no effect on postoperative discomfort or the need for painkillers. Therefore, All three root canal sealers in the research predict short-term postoperative discomfort. The null hypothesis has been accepted so far. In vitro studies showed diversity in root canal sealer cytotoxicity and inflammation. In addition, Root canal sealers have been demonstrated to directly stimulate trigeminal nociceptors, resulting in discomfort and neurogenic inflammation [11]. However, Since the tested sealers in this study had no influence on postoperative pain, these differences and results did not seem to have any clinical value. This study supports other studies' findings, which also indicated that there was no difference in postoperative pain when filling root canals with different sealants.

The incidence of postoperative pain was low in this randomized clinical trial (14.6% in 24 h and 6.66% in 48 h). The literature indicates a great variability of postoperative pain results that can range from 3–58%[12].This high level of variability can be attributed to the startling variations in treatment protocols, pulp and periradicular conditions, and postoperative assessment methods that were found between investigations. Several research have examined the impact of root canal sealers on post-operative discomfort, In a split-mouth randomized clinical experiment, Graunaite et al.[14] observed that 35% of the patients reported feeling discomfort from their apical periodontitis in single-rooted teeth that had previously had endodontic treatment [13], [14].

In a randomized controlled clinical trial with vital and non-vital mandibular premolars and molars, Ates et al.[15], found that 68 % and 59 % of patients had discomfort in teeth filled with AH Plus and I Root, respectively. In both vital and non-vital teeth, Shashirekha et al. [16] evaluation of pain in apically extruded sealers did not specify the proportion of patients who had postoperative discomfort.After root canal therapy, some discomfort known as sensitivity is normal and is brought on by clamp insertion, physical stress brought on by instruments, and chemical treatments [17].To properly determine the apical constriction in the current investigation and prevent over-instrumentation and over-filling, an electronic apex finder was employed. In none of the cases was intentional sealer extrusion done. However, it happened inadvertently in 2 of them; however, these few instances couldn't have affected how postoperative pain developed [18],[19].

In contrast to other studies, the root canal filling procedure utilized in this one may have contributed to the low prevalence of postoperative discomfort. Therefore, rather than the root canal sealer, the root canal filling technique is probably to blame for the post-obturation pain. While systemic illnesses served as ethical exclusion criteria, immunological responses that could be related to postoperative sealing reactions were minimized. Postoperative pain decreased in

this study. No patient had difficulty after 7 days, and no participant scheduled an intervention. Both findings are common in research on postoperative pain[15], [23],[24],[25]

In the present study, molars were purposefully excluded because it is already known that this group of teeth presents a higher incidence of postoperative pain. [20],[26],[27] Additionally, only asymptomatic patients were enrolled because preoperative pain is known to be a significant predictor of postoperative pain. Post-endodontic pain is multifactorial in nature and is influenced by factors inherent to patients and tooth conditions [20],[22],[27].

male and female respond to pain differently, and women are at a higher risk for numerous clinical pain problems, such as tooth pain. [29],[30]. Some research suggests a greater frequency and longer duration of post-endodontic pain in females,[20],[22] while others [28].find that males have longer suffering than females.No significant connection was discovered between patient-related characteristics and postoperative pain, including gender, in the current investigation [14]. Subjectivity is an issue when analyzing pain. Each person's pain threshold depends on cultural, personal, and economic factors. Several endodontic postoperative pain studies have utilized the VAS to evaluate pain [13] ,[15],[16],[23],[24],[31],[32]. In the present study, the incidence and intensity of postoperative pain were quantified using a simple descriptive scale. VAS and this approach are equivalent, as tested [21].

Conclusion

The filling of root canals with MTA Fillapex, CPM sealer, and AH Plus resulted in the same postoperative pain occurrence and intensity, and the need for analgesic intake.

References

1. Adnan, S., &Ullah, R. (2018). Top-cited articles in regenerative endodontics: a bibliometric analysis. Journal of Endodontics, 44(11), 1650-1664.
2. Aminsobhani, M., Meraji, N., Khoshdel, A., &Ghorbanzadeh, A. (2017). The effect of root canal preparation using single versus multiple endodontic rotary files on post-operative pain, a randomised clinical trial. European Endodontic Journal, 2(1), 1.
3. Arias, A., De la Macorra, J. C., Hidalgo, J. J., &Azabal, M. (2013). Predictive models of pain following root canal treatment: a prospective clinical study. International endodontic journal, 46(8), 784-793.
4. Assmann, E., Scarparo, R. K., Böttcher, D. E., &Grecca, F. S. (2012). Dentin bond strength of two mineral trioxide aggregate–based and one epoxy resin–based sealers. Journal of endodontics, 38(2), 219-221.
5. AtavAtes, A., Dumani, A., Yoldas, O., &Unal, I. (2019). Post-obturation pain following the use of carrier-based system with AH Plus or iRoot SP sealers: a randomized controlled clinical trial. Clinical Oral Investigations, 23(7), 3053-3061.

6. Chellapandian, K., Reddy, T. V. K., Venkatesh, V., &Annapurani, A. Bioceramic root canal sealers: A review. International Journal of Health Sciences, (III), 5693-5706.
7. Comparin, D., Moreira, E. J. L., Souza, E. M., De-Deus, G., Arias, A., & Silva, E. J. N. L. (2017). Postoperative pain after endodontic retreatment using rotary or reciprocating instruments: a randomized clinical trial. Journal of Endodontics, 43(7), 1084-1088.
8. D'souza, L. H. J., Sharma, N., Chander, S., Singh, S., & D'Souza, R. (2012). Root canal sealers and its role in successful endodontics-A review. Annals of Dental Research, 2(2), 68-78.
9. Farfán, R. F. M., Zambrano, T. Y. M., Badillo, F. R. A., & Solís, A. A. H. (2020). Design and construction of an industrial ship conditioning system. *International Journal of Physical Sciences and Engineering*, *4*(1), 29–38. https://doi.org/10.29332/ijpse.v4n1.423
10. Ferreira, N. D. S., Gollo, E. K. F., Boscato, N., Arias, A., & Silva, E. J. N. L. D. (2020). Postoperative pain after root canal filling with different endodontic sealers: a randomized clinical trial. Brazilian Oral Research, 34.
11. Ferreira, N. D. S., Gollo, E. K. F., Boscato, N., Arias, A., & Silva, E. J. N. L. D. (2020). Postoperative pain after root canal filling with different endodontic sealers: a randomized clinical trial. Brazilian Oral Research, 34.
12. Fonseca, B., Coelho, M. S., da Silveira Bueno, C. E., Fontana, C. E., De Martin, A. S., & Rocha, D. G. P. (2019). Assessment of extrusion and postoperative pain of a bioceramic and resin-based root canal sealer. European journal of dentistry, 13(03), 343-348.
13. Garg, N., & Garg, A. (2010). Textbook of endodontics. Boydell& Brewer Ltd.
14. Herpich, C. M., Politti, F., Gomes, C. A. F. D. P., Gloria, I. P. D. S., Amaral, A. P., Amaral, M. D. F. R. D. S., ... &Biasotto-Gonzalez, D. A. (2018). Evaluation of pain threshold upon palpation of the masticatory muscles in women with temporomandibular disorder according to the Research Diagnostic Criteria of Temporomandibular Disorders. Revista CEFAC, 20, 175-181.
15. Iranmanesh, F., Parirokh, M., Haghdoost, A. A., & Abbott, P. V. (2017). Effect of corticosteroids on pain relief following root canal treatment: A systematic review. Iranian endodontic journal, 12(2), 123.
16. Iranmanesh, P., Khazaei, S., Nili, M., Saatchi, M., Aggarwal, V., Kolahi, J., &Khademi, A. (2022). Anaesthetic efficacy of incorporating different additives into lidocaine for the inferior alveolar nerve block: A systematic review with meta-analysis and trial sequential analysis. International endodontic journal.
17. Jamali, S., Darvish, M., Nasrabadi, N., &Jafarizadeh, S. (2021). Evaluation of the Effect of the Intensity and Occurrence of Postoperative Pain of Resin-Based and Bioceramic Root Canal Sealers: A Systematic Review and Meta-Analysis of Randomized Controlled Trial Studies. PesquisaBrasileiraemOdontopediatria e ClínicaIntegrada, 21.
18. Kaur, A., Shah, N., Logani, A., & Mishra, N. (2015). Biotoxicity of commonly used root canal sealers: A meta-analysis. Journal of conservative dentistry: JCD, 18(2), 83.
19. Krithikadatta, J., Sekar, V., Sudharsan, P., &Velumurugan, N. (2016). Influence of three Ni–Ti cleaning and shaping files on postinstrumentation endodontic pain: A triple-blinded, randomized, controlled trial. Journal of conservative dentistry: JCD, 19(4), 311.

20. Kumar, S. A., Shivanna, V., Naian, M. T., &Shivamurthy, G. B. (2011). Comparative evaluation of the apical sealing ability and adaptation to dentine of three resin-based sealers: An in vitro study. Journal of conservative dentistry: JCD, 14(1), 16.
21. Nagendrababu, V., &Gutmann, J. L. (2017). Factors associated with postobturation pain following single-visit nonsurgical root canal treatment: A systematic review. Quintessence International, 48(3).
22. Nekoofar, M. H., Sheykhrezae, M. S., Meraji, N., Jamee, A., Shirvani, A., Jamee, J., &Dummer, P. M. (2015). Comparison of the effect of root canal preparation by using WaveOne and ProTaper on postoperative pain: a randomized clinical trial. Journal of endodontics, 41(5), 575-578.
23. Nurmala, N., & Irwan, D. (2022). Identification of the best practical education evaluation management based on virtual applications in the digital era. *International Research Journal of Management, IT and Social Sciences*, *9*(3), 305-316. https://doi.org/10.21744/irjmis.v9n3.2072
24. Pieretti, S., Di Giannuario, A., Di Giovannandrea, R., Marzoli, F., Piccaro, G., Minosi, P., &Aloisi, A. M. (2016). Gender differences in pain and its relief. Annalidell'Istitutosuperiore di sanita, 52(2), 184-189.
25. Sadaf, D., & Ahmad, M. Z. (2014). Factors associated with postoperative pain in endodontic therapy. International journal of biomedical science: IJBS, 10(4), 243.
26. Saini, H. R., Sangwan, P., &Sangwan, A. (2016). Pain following foraminal enlargement in mandibular molars with necrosis and apical periodontitis: a randomized controlled trial. International Endodontic Journal, 49(12), 1116-1123.
27. Scaramucci, T., Borges, A. B., Lippert, F., Zero, D. T., Aoki, I. V., & Hara, A. T. (2015). Anti-erosive properties of solutions containing fluoride and different film-forming agents. Journal of Dentistry, 43(4), 458-465.
28. Shashirekha, G., Jena, A., Pattanaik, S., &Rath, J. Assessment of pain and dissolution of apically extruded sealers and their effect on the periradicular tissues. J Conserv Dent 2018; 21: 546-550.
29. Silva, E. J. N. L., Menaged, K., Ajuz, N., Monteiro, M. R. F. P., & de Souza Coutinho-Filho, T. (2013). Postoperative pain after foraminal enlargement in anterior teeth with necrosis and apical periodontitis: a prospective and randomized clinical trial. Journal of endodontics, 39(2), 173-176.
30. SİVAS, Ö., Keskin, C., ACAR, D. H., &Aydemir, H. (2022). Comparison of postoperative pain after the use of different nickel-titanium instrumentation systems: A randomized clinical trial. European Oral Research, 56(2), 102-109.
31. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2022). Post-pandemic health and its sustainability: Educational situation. *International Journal of Health Sciences*, *6*(1), i-v. https://doi.org/10.53730/ijhs.v6n1.5949
32. Tungsawat, P., &Tanompetsanga, P. (2018). Comparison of microleakage between resin-based and bioceramic-based root canal sealers by fluid filtration technique. Mahidol Dental Journal, 38(3), 279-286.
33. Xaviér, F. C., Carrilho, P. Z., Viscardi, P. H., Kuga, M. C., de Campos, E. A., & Silvestre, N. P. (2011). Hydrogen ion and calcium releasing of MTA Fillapex® and MTA-based formulations. RSBO RevistaSul-Brasileira de Odontologia, 8(3), 271-276.

34. Yaylali, I. E., Teke, A., &Tunca, Y. M. (2017). The effect of foraminal enlargement of necrotic teeth with a continuous rotary system on postoperative pain: a randomized controlled trial. Journal of Endodontics, 43(3), 359-363.
35. Yücel, O., Ekici, M. A., Ilk, O., Ilhan, M. N., &Kayaoglu, G. (2018). Predicting intraoperative pain in emergency endodontic patients: clinical study. Brazilian Oral Research, 32.