Prevalence of usage of different retrograde filling materials during perforation repair.

Swetaa A, Vigneshwar*

Department of Conservative Dentistry and Endodontics , Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Science(SIMATS) Saveetha University, Chennai , Tamilnadu, India

Abstract

Introduction: Perforations from the pulp to the surrounding periodontium may occur from resorptive defects, caries or iatrogenic events during endodontic treatment. Perforations create an artificial communication between the root canal system and the supporting tissues of the teeth. Factors that affect treatment prognosis of perforation repair include the level, location and size of the perforation, the time delay before perforation repair and the material used to seal the perforation. An insufficient access cavity reduces the quality of root canal debridement and may affect the final root canal preparation shape. The aim of the study is to determine the prevalence of usage of retrograde filling material in perforation repair.

Material and methods: The study was done in an institutional setting. This is a retrospective study in which the case records of 70 patients were reviewed and details such as gender, age, type of materials used were collected. Details were tabulated in excel and results were obtained using SPSS. Chi square analysis was performed to find out the association between different variables.

Results: The age group of 36-50 years was high with perforation repair which is about 50%, people of 15-35 years age group were 27.94% and 50-80 years were about 22%. Female patient who have perforation repair were high which is about 51.47% compared to males which is about 48.53%.Types of materials used during perforation repair were bio-aggregate material which is about 75%, RMGIC which is about 10.29%, GIC is about 10.29% and calcium hydroxide which is about 4.41%. Bio-aggregate material is most commonly used in 36-50 years which is about 38.4% where the p> 0.05 value is not significant.

Conclusion: Within the limits of the study, it was concluded that bio-aggregate material was the most common material used during perforation repair with female predilection.

Keywords: Perforation repair, Female, Bio-aggregate material, Root canal treatment, Root perforation.

Introduction

Perforations from the pulp to the surrounding periodontium may occur from resorptive defects, caries or iatrogenic events during endodontic treatment. Perforations create an artificial communication between the root canal system and the supporting tissues of the teeth [1]. Factors that affect treatment prognosis of perforation repair include the level, location and size of the perforation, the time delay before perforation repair and the material used to seal the perforation. An insufficient access cavity reduces the quality of root canal debridement and may affect the final root canal preparation shape. An exaggerated or misdirected access cavity is also conducive to root perforation, and makes the tooth susceptible to coronal/radicular fracture [2,3]. Root perforation, overfilling, endodontic and periodontal lesions, root fracture, periapical biofilm, traumatic dental injury, instrument fracture, apical periodontitis, and root resorption characterize the complex challenge facing the endodontists, and these may contribute (alone or in association) to a doubtful or poor prognosis [4].

During the operative procedures, the endodontists must avoid and prevent these nocuous events, since intra-operative accidents are risk factors that may result in failure of root canal treatment. Successful root canal treatment entails understanding the risk factors associated with root canal treatment failure [5]. Root perforation may occur in different clinical conditions, which the patient should be immediately informed of, together with the procedures to be followed, the treatment options and the prognosis [6,7]. Root perforation constitutes a serious complication which needs to be diagnosed early and treated immediately and appropriately. The consequences of root perforation may result in an inflammatory response associated with periodontal tissue and alveolar bone destruction [8]. Depending on the severity of the injury, and possible chronic inflammatory reaction, it may cause the development of granulomatous tissue, proliferation of the epithelium, and, eventually, the development of a periodontal pocket. Lack of understanding of root perforations and their consequences, to the extent that could delay diagnosis and treatment, may cause future problems leading to tooth loss [9].

***Correspondence to:** Vigneshwar, Department of Conservative Dentistry and Endodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Science(SIMATS) Saveetha University, Chennai, Tamilnadu, India E-mail: 151701019.sdc@gmail.com

***Received:** 16-Aug-2022 Manuscript No. AACDOH-22-70343; **Editor assigned:** 19-Aug-2022 PreQC No. AACDOH-22-70343 (PQ); **Reviewed:** 02-Sep-2022 QC No. AACDOH-22-70343; **Revised:** 08-Sep-2022 Manuscript No. AACDOH-22-70343 (R); **Published:** 15-Sep-2022 DOI: 10.35841/aacdoh-6.5.125*

***Citation:** Swetaa A, Vigneshwar. Prevalence of usage of different retrograde filling materials during perforation repair. J Clinic Dent Oral Health. 2022;6(5):125*

Biocompatible materials with a short setting time and good sealability should be selected. The location of the perforation is of crucial importance. Close proximity to the gingival sulcus may lead to endodontic-periodontal problems through contamination of the perforation with bacteria from the oral cavity through the sulcus. It is important that the level of crestal bone and epithelial attachment is taken into consideration. If the perforation lies coronal of the crestal bone it will be easy to treat and have a good prognosis [10]. Perforations near the crestal bone are susceptible to epithelial migration and rapid pocket formation and treatment of these has a low success rate [11].

MTA was originally designed for application in endodontic surgery as a root-end filling material, but, other indications for it will include direct and indirect pulp capping, pulpotomy, treatment of internal and external resorption and treatment of teeth with incomplete root formation [12].The purpose of the present clinical trial was to compare clinically and radiographically the success rate of two root end filling materials using pro root type MTA and zinc free amalgam in reapicoectomies teeth. Glass ionomer cements are used in surgical endodontics and they have been advocated for use as a perforation repair material as well [13,14]. One advantage is its adhesiveness to dentine, and several studies demonstrate its good sealing ability both in vitro and in vivo. However, other studies have shown that resin modified glass ionomer cement showed more microleakage and less sealing ability compared to MTA cement [15]. The aim of the study is to determine the prevalence of usage of retrograde filling material in perforation repair. Our team has extensive knowledge and research experience that has translate into high quality publications [16--35]. The aim of this study is to analysis the prevalence of usage of different retrograde filling materials during perforation repair

Material and Methods

Study Setting

A retrospective study was carried out among patients in a University hospital setting. This is based on a university setting because data available was in the similar ethnicity with the particular geographic location. The trends in the other locations that were not assessed in the study setting. Ethical approval was taken from the universal ethical committee. In total, three reviewers were involved to cross verify data.

Sampling

The sample was collected from records with patients' data like: PID, Name, Age, Gender, treatment, Teeth number, and Materials used in treatment, Date of their first visit from June 2019 to June 2021 and tabulation was done in a chronological order using Excel. Case sheet review was done under the examiner followed by cross verification.

The study sample size included patients who underwent perforation repair and data retrieved was n=70.Statistical method used in this study was the Chi-Square test and the software was SPSS by IBM. Patients who underwent Root canal treatment with perforation repair were considered as dependent variables and their Age, Teeth number, Gender, Type of materials used were considered as a definite variable. The type of analysis used was Correlation and association which is a descriptive type of data analysis.

Results

From the study, we have observed that the age group of 36-50 years was high with perforation repair which is about 50%, people of 15-35 years age group were 27.94% and 50-80 years were about 22% (Figure 1). Female patient who have

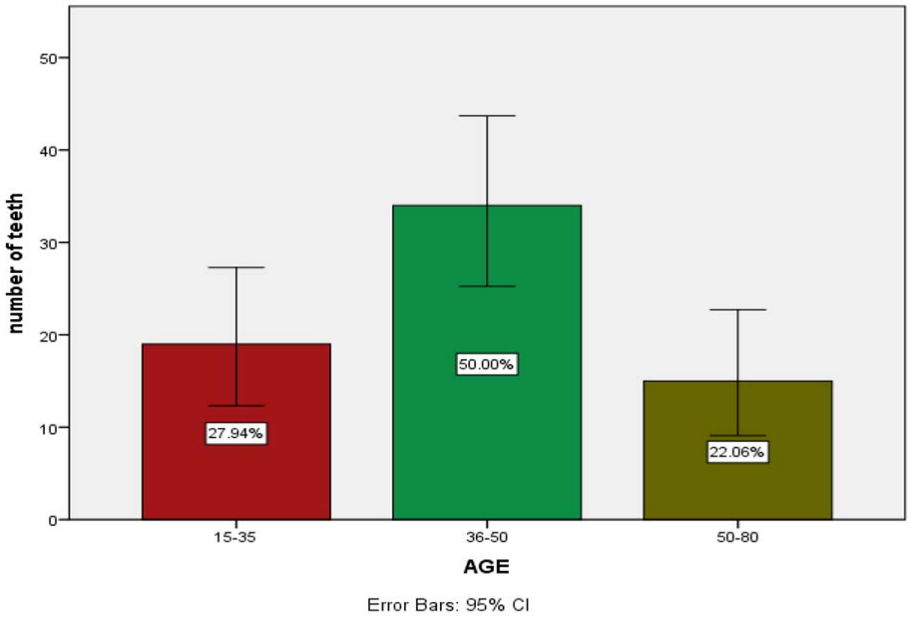

Figure 1. *The bar graph of distribution of age among people who underwent Root canal treatment with perforation repair. The age group of patients were mentioned in X-axis which was categorized as 15-35 years, 36-50 years, 50-80 years and the percentage of patients who underwent Root canal treatment with perforation repair were mentioned in Y-axis. Of these, people of the age range 36-50 years who received Root Canal treatment with perforation repair were at a higher rate (50%),age group 15-35 years (27.94%) and 50-80 years (22.06%).*

Citation: *Swetaa A, Vigneshwar. Prevalence of usage of different retrograde filling materials during perforation repair. J Clinic Dent Oral Health. 2022;6(5):125*

perforation repair were high which is about 51.47% compared to males which is about 48.53% (Figure 2). Types of materials used during perforation repair were bio-aggregate material which is about 75%, RMGIC which is about 10.29%, GIC is about 10.29% and calcium hydroxide which is about 4.41% (Figure 3). Bio-aggregate material is most commonly used in 36-50 years which is about 38.4% where the p>0.05 value is not significant (Figure 4). Bio- aggregate is commonly used in the female population which is about 41.1% and the p>0.05 values are found to be significant (Figure 5).

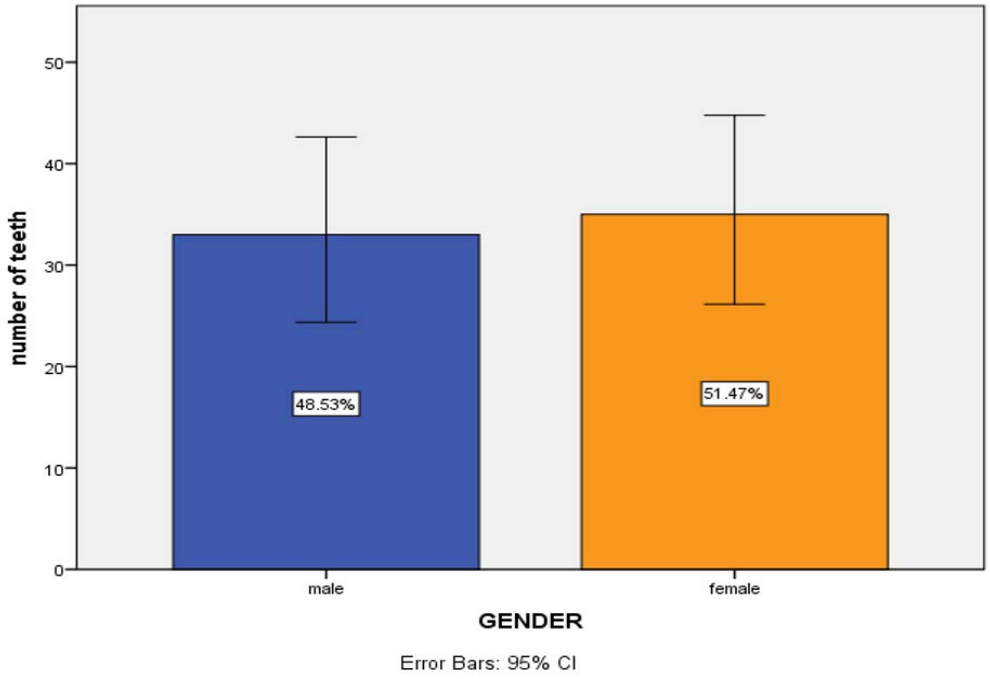

Figure 2. *The bar graph of distribution of Gender among people who underwent Root Canal Treatment with perforation repair. The Gender of patients were mentioned in X-axis which were categorized as Female and Males and the percentage of patients who received Root Canal Treatment with perforation repair were mentioned in Y-axis. Of these, female patients were at a higher rate (51.47%) than males (48.53%).*

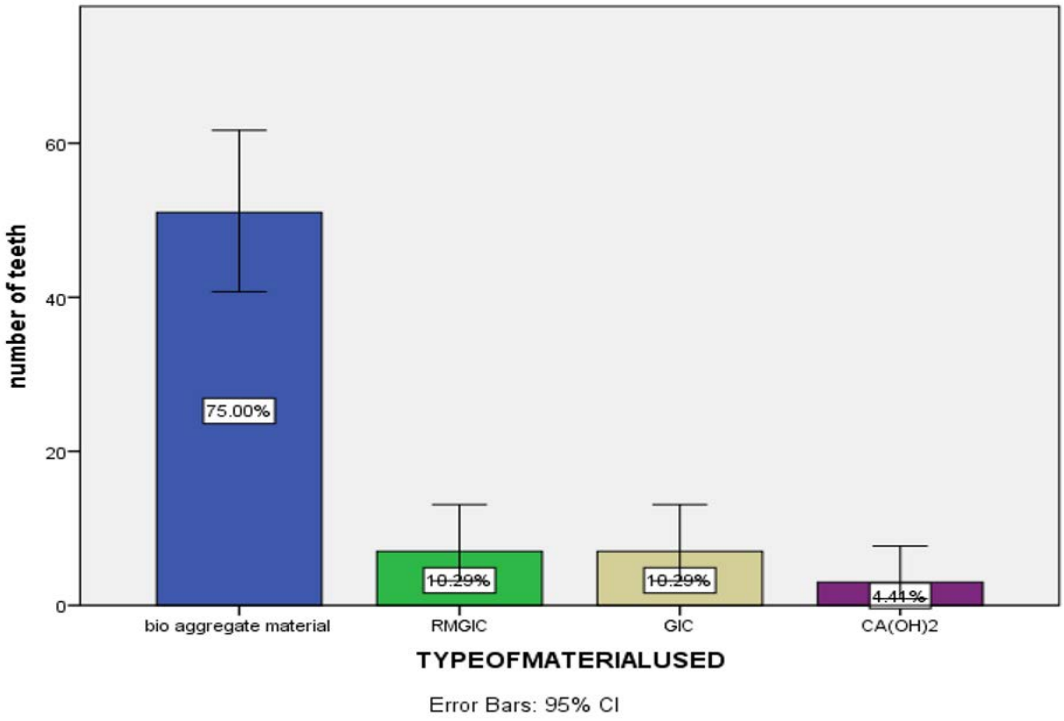

Figure 3. *The bar graph of distribution of type of material used for perforation. The type of materials used were mentioned in X-axis which were categorized as bio-aggregate material, RMGIC, GIC, Calcium hydroxide and the percentage of patients who used the materials were mentioned in Y-axis. Of these, bio-aggregate materials were used commonly which is about 75%, RMGIC material was 10.29%, GaiC material was 10.29% and calcium hydroxide was 4.41%.*

Citation: *Swetaa A, Vigneshwar. Prevalence of usage of different retrograde filling materials during perforation repair. J Clinic Dent Oral Health. 2022;6(5):125*

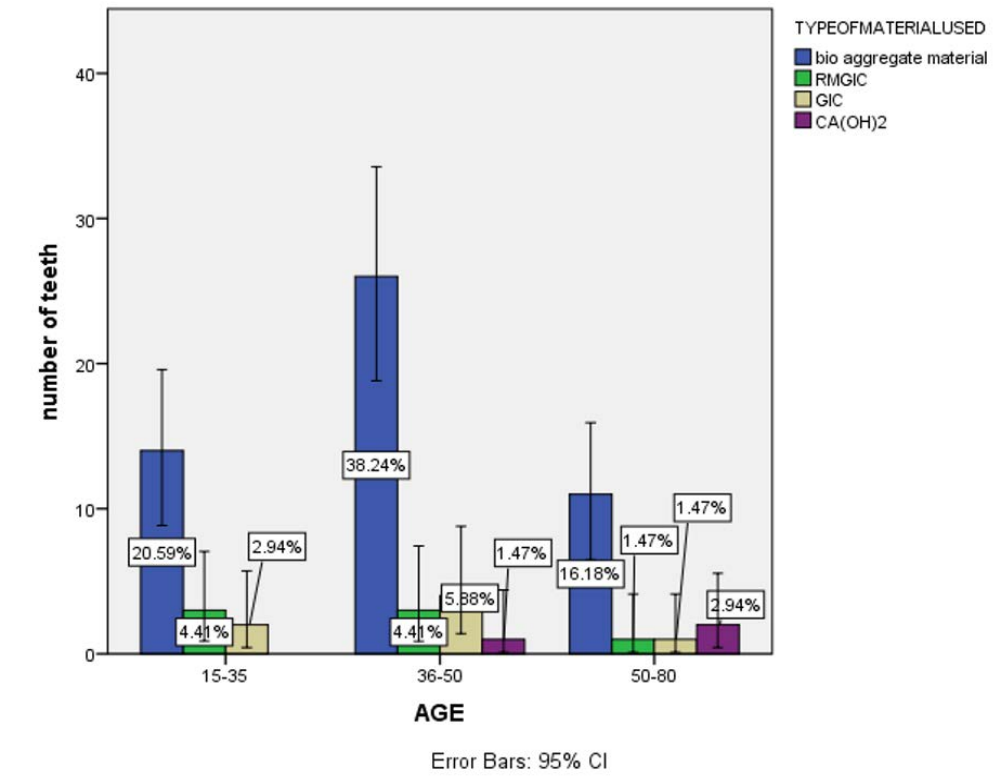

Figure 4. *The bar graph represents the association between type of materials used and age of patients who received Root Canal Treatment with perforation repair where X-axis represents age with types of material used and Y-axis represents the percentage of patients who received Root canal treatment with perforation repair. Bio-aggregate material was used in a higher incidence among 36-50 years of age group people in association with the type of materials used. P-value>0.05(Chi-square value -4.816a; P-value: 0.568). Hence, statistically not significant.*

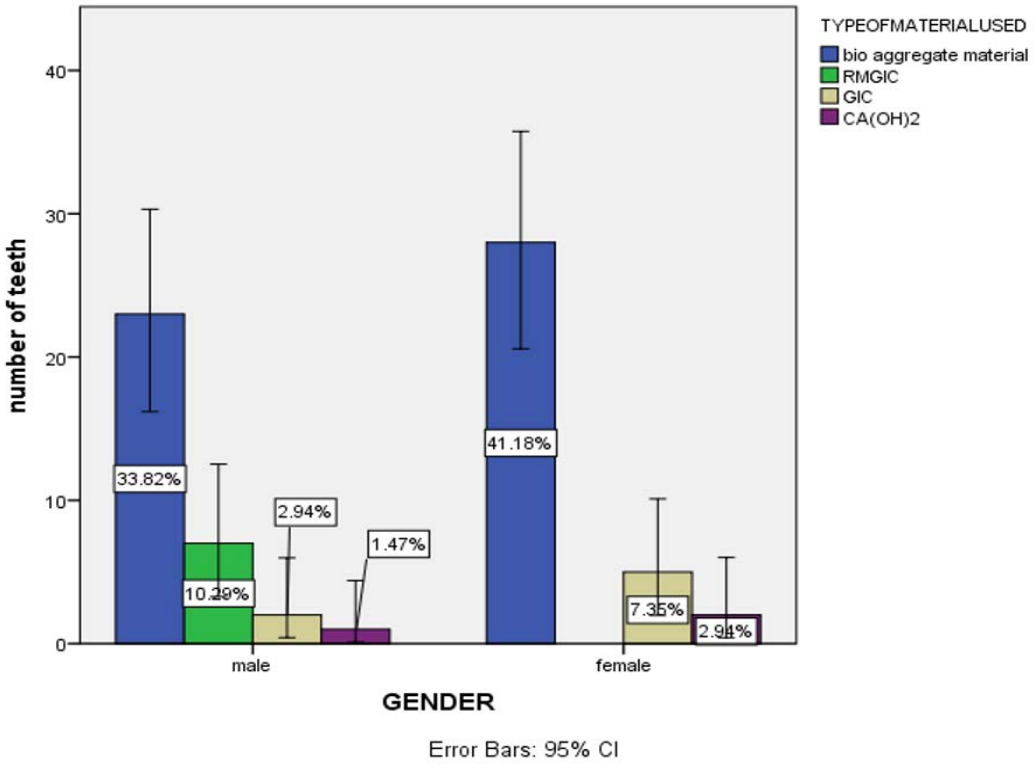

Figure 5. *The bar graph represents the association between type of materials used and gender of patients who received Root Canal Treatment with perforation repair where X-axis represents gender with types of material used and Y-axis represents the percentage of patients who received Root canal treatment with perforation repair. Bio-aggregate material was used in a higher incidence among females in association with the type of materials used. P-value >0.05(Chi-square value -9.058; P-value: 0.029). Hence, it is statistically significant.*

Citation: *Swetaa A, Vigneshwar. Prevalence of usage of different retrograde filling materials during perforation repair. J Clinic Dent Oral Health. 2022;6(5):125*

Discussion

According to Santi vajja, et al. [36] Apical leakage was seen in all groups with 1 mm depth root end cavities irrespective of the materials used. MTA with 2 mm thickness, RMGIC of 3 mm thickness and IRM with 4 mm thickness was effective to prevent apical microleakage. The apical leakage decreased with an increase in the thickness of root end filling materials. Our findings suggest MTA is a promising alternative in comparison with several existing materials as root end filling materials.

According to Carlos Estrela, et al. [37] root perforation during operative procedures should be prevented. Diagnosis and immediate sealing, intensity of aggression, control of contamination, relationship to crestal bone and epithelial attachment are factors that have an impact on the prognosis. Physicochemical, histological and clinical studies have indicated MTA as a good sealer for these situations, but one which lacks a good esthetic outcome.

According to Lodiene, et al. [38] the resin composite material leaked significantly more than the MTA and glass ionomer cements when used to repair large furcation perforations. Bacteria could penetrate into dentine even at a distance from the perforation filling.

According to Ovasay, et al. [39] MTA was determined as the most successful in terms of preventing microleakage when compared with IRM and Biodentine. The diameter of the perforation was found to have an impact on microleakage and the perforation which is 2 mm in diameter exhibited less leakage compared to a 4 mm perforation. The amount of microleakage increased by time in all materials.

Conclusion

Within the limits of the study, it was concluded that bio-aggregate material was the most common material used during perforation repair with female predilection. Furthermore studies to be done in a larger sample size for better results.

Acknowledgment

I sincerely thank my Guide, Mentor, Department of Research & IT Saveetha Dental College and Hospitals, Saveetha Institute Medical and Technical Sciences, Saveetha University for making me complete the research work.

Funding

The present project is supported/funded/sponsored by Saveetha Institute of Medical and Technical Sciences, Saveetha Dental College and Hospitals, Saveetha University contributed by Southern Engineering Co Ltd.

Conflict Of Interest:

All authors do not have any possible conflicts of interest.

References

1. Sinai IH. Endodontic perforations: Their prognosis and treatment. J Am Dent Assoc. 1977;95(1):90-95.
2. Seltzer S, Sinai I, August D. Periodontal effects of root perforations before and during endodontic procedures. J Dent Res. 1970;49(2):332-339.
3. McAree DC. The biocompatibility of endodontic retrograde filling materials. (Doctoral dissertation, University of Melbourne). 1990;382.
4. Balla R, LoMonaco CJ, Skribner J, et al. Histological study of furcation perforations treated with tricalcium phosphate, hydroxylapatite, amalgam, and life. J Endod. 1991;17(5):234-238.
5. Fuss Z, Trope M. Root perforations: Classification and treatment choices based on prognostic factors. Dent Traumatol. 1996;12(6):255–264.
6. Foreman PC. Non-surgical repair to an iatrogenic perforation of the root canal: A case history. Br Dent J. 1985;158(3):97.
7. Tsesis I, Fuss Z. Diagnosis and treatment of accidental root perforations. Endod Topics. 2006;13(1):95–107.
8. Hartwell GR, England MC. Healing of furcation perforations in primate teeth after repair with decalcified freeze-dried bone: A longitudinal study. J Endod. 1993;19(7)357–361.
9. Chordiya R, Metgud S, Hiremath H, et al. Evaluation of the sealing ability of bone cement as furcation perforation repair material when compared with mineral trioxide aggregate and calcium phosphate cement: An in-vitro study. J Int Clin Dent Res Organization. 2010;2(2):75.
10. Bruyne MAAD, De Bruyne MAA, De Moor RJG. The use of glass ionomer cements in both conventional and surgical endodontics. Int Endod J. 2004;37(2):91–104.
11. Maher WP, Johnson RL, Hess J, et al. Biocompatibility of retrograde filling materials in the ferret canine Amalgam and IRM. Oral Surg Oral Med Oral Pathol. 1992;(73):738–745.
12. Kennethweldonjr J, Pashley D, Loushine R, et al. Sealing ability of mineral trioxide aggregate and super-EBA when used as furcation repair materials: A longitudinal study. J Endod. 2002;28(6):467–470.
13. Behnia A, Strassler HE, Campbell R. Repairing iatrogenic root perforations. J Am Dent Assoc. 2000;131(2):196–201.
14. Daoudi MF, Saunders WP. *In vitro* evaluation of furcal perforation repair using mineral trioxide aggregate or resin modified glass ionomer cement with and without the use of the operating microscope. J Endod. 2002;28(7):512-515.
15. Kishan K, Parikh M, Parikh M. Comparative evaluation of effect of chloroquick irrigating solution on push-out bond strength of endoseal mineral trioxide aggregate and endosequence root repair material when used as furcal perforation repair material: An in vitro study. J Conserv Dent. 2020;28(7):259.
16. Muthukrishnan L. Imminent antimicrobial bioink deploying cellulose, alginate, EPS and synthetic polymers for 3D bioprinting of tissue constructs. Carbohydr Polym. 2021;260:117774.

Citation: *Swetaa A, Vigneshwar. Prevalence of usage of different retrograde filling materials during perforation repair. J Clinic Dent Oral Health. 2022;6(5):125*

17. PradeepKumar AR, Shemesh H, Nivedhitha MS, et al. Diagnosis of vertical root fractures by cone-beam computed tomography in root-filled teeth with confirmation by direct visualization: A systematic review and meta-analysis. J Endod. 2021;47(8):1198-214.

18. Chakraborty T, Jamal RF, Battineni G, et al. A review of prolonged post-COVID-19 symptoms and their implications on dental management. Int J Environ Res Public Health. 2021;18(10):5131.

19. Muthukrishnan L. Nanotechnology for cleaner leather production: A review. Environ Chem Lett. 2021;19(3):2527–2549.

20. Teja KV, Ramesh S. Is a filled lateral canal-A sign of superiority? J Dent Sci. 2020;15(4):562.

21. Narendran K, Jayalakshmi, Ms N, Sarvanan A, et al. Synthesis, characterization, free radical scavenging and cytotoxic activities of phenylvilangin, a substituted dimer of embelin. Ijps. 2020;82(5).

22. Reddy P, Krithikadatta J, Srinivasan V, et al. Dental caries profile and associated risk factors among adolescent school children in an urban South-Indian city. Oral Health Prev Dent. 2020;18(1):379-386.

23. Sawant K, Pawar AM, Banga KS, et al. Dentinal microcracks after root canal instrumentation using instruments manufactured with different NiTi alloys and the SAF system: A systematic review. Appl Sci. 2021;11(11):4984.

24. Bhavikatti SK, Karobari MI, Zainuddin SL, et al. Investigating the antioxidant and cytocompatibility of Mimusops elengi Linn extract over human gingival fibroblast cells. Int J Environ Res Public Health. 2021;18(13):7162.

25. Karobari MI, Basheer SN, Sayed FR, et al. An *in vitro* stereomicroscopic evaluation of bioactivity between Neo MTA Plus, Pro Root MTA, BIODENTINE & glass ionomer cement using dye penetration method. Materials. 2021;14(12):3159.

26. Rohit Singh T, Ezhilarasan D. Ethanolic extract of *Lagerstroemia speciosa* (L.) Pers., induces apoptosis and cell cycle arrest in HepG2 cells. Nutr Cancer. 2020;72(1):146-156.

27. Ezhilarasan D. MicroRNA interplay between hepatic stellate cell quiescence and activation. Eur J Pharmacol. 2020;885:173507.

28. Romera A, Peredpaya S, Shparyk Y, et al. Bevacizumab biosimilar BEVZ92 versus reference bevacizumab in combination with FOLFOX or FOLFIRI as first-line treatment for metastatic colorectal cancer: A multicentre, open-label, randomised controlled trial. Lancet Gastroenterol Hepatol. 2018;3(12):845–855.

29. Raj R K. β-Sitosterol-assisted silver nanoparticles activates Nrf2 and triggers mitochondrial apoptosis via oxidative stress in human hepatocellular cancer cell line. J Biomed Mater Res. 2020;108(9):1899-1908.

30. Vijayashree Priyadharsini J. *In silico* validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. J Periodontol. 2019;90(12):1441.

31. Priyadharsini JV, Girija AS, Paramasivam A. In silico analysis of virulence genes in an emerging dental pathogen *A. baumannii* and related species. Arch Oral Biol. 2018;94:93-98.

32. Uma Maheswari TN, Nivedhitha MS, Ramani P. Expression profile of salivary micro RNA-21 and 31 in oral potentially malignant disorders. Braz Oral Res. 2020;34:e002.

33. Gudipaneni RK, Alam MK, Patil SR, et al. Measurement of the maximum occlusal bite force and its relation to the caries spectrum of first permanent molars in early permanent dentition. J Clin Pediatr Dent. 2020;44(6):423–428.

34. Chaturvedula BB, Muthukrishnan A, Bhuvaraghan A, et al. Dens invaginatus: A review and orthodontic implications. Br Dent J. 2021;230(6):345–350.

35. Kanniah P, Radhamani J, Chelliah P, et al. Green synthesis of multifaceted silver nanoparticles using the flower extract of Aerva lanata and evaluation of its biological and environmental applications. Chem Select. 2020;5(7):2322–2331.

36. Vajja S, Naik BD, Vummidisetti SV, et al. Influence of different thickness of mineral trioxide aggregate, resin modified glass ionomer cement and intermediate restorative material on sealing ability of root end fillings: An *in vitro* study. J Clin Diagn Res. 2018;12(1).

37. Estrela C, Decurcio DD, Rossi-Fedele G, et al. Root perforations: A review of diagnosis, prognosis and materials. Br Oral Res. 2018;32.

38. Lodiene G, Kleivmyr M, Bruzell E, et al. Sealing ability of mineral trioxide aggregate, glass ionomer cement and composite resin when repairing large furcal perforations. Br Dent J. 2011;210(5):E7.

39. Övsay E, Kaptan RF, Şahin F. The Repair of furcal perforations in different diameters with biodentine, MTA, and IRM repair materials: A laboratory study using an *E. faecalis* leakage model. Bio Med Res Int. 2018;2018:1–5.