Type of Manuscript: *Retrospective study*

Assessment of Postoperative Obturation Quality of Retreatment Cases - A Retrospective Study

Jerry Jose[1], Subash Sharma[2], Surendar Sugumaran

[1]Research Associate, Dental Research Cell, Department of Conservative dentistry and Endodontics, [2]Reader, [3]Senior lecturer, Department of Conservative Dentistry and Endodontics, Saveetha Dental College, Saveetha Institute of Medical And Technical Sciences, Saveetha University, Chennai, India

Abstract

Conventional endodontic therapy emphasizes many factors which mainly emphasize root canal disinfection. However there is a probability of endodontic therapy to give an unfavourable outcome such as persistent clinical symptoms and unfavourable periapical healing. The frequency of failure is reported to be around 20% and various factors contribute to it which mostly relies on the treatment procedure followed by the previous operator. It is of paramount importance that postgraduate doctors should learn to treat these case scenarios with high effectiveness. This study aims to assess the postoperative obturation quality of retreatment cases done by graduate doctors. The study was done by using data collected from electronic medical records of Saveetha Dental College, Chennai, India. The time frame of data collection was seen from June 2019 to March 2020. A total sample size of 230 was assessed radiographically and the quality of obturation was analyzed using 2 grading criteria in compliance with 2 operators. From the cases assessed, about 80% had achieved correct radiographic length of obturation and about 70% of obturation was not of optimal quality. Quality of obturation was not adequate. The length of root canal filling was desirable whereas the quality of condensation was not adequate about 60% of the assessed cases

Keywords: *Retreatment, Dental graduate, Electronic medical records, retrospective studies, Root canal obturation*

Introduction

The application of orthograde endodontic retreatment is fairly common clinical practice especially for an endodontic specialist [1]. Various epidemiological studies have been done showing a need for endodontic treatment due to the increased number of poor root canal therapy and persistent clinical symptoms for the clinician [2,3].

Corresponding Author
Subash Sharma
Reader, Department of Conservative Dentistry and Endodontics, Saveetha Dental College
Saveetha Institute of Medical and Technical Sciences, Saveetha University, 162, Poonamallee High Road
Chennai 600077, India
E-Mail: subash@saveetha.com

It is well known that endodontic treatment has a viable outcome and is dependent on various factors such as operator factors, healing outcomes, tooth complexity and patient related factors [4]. All these factors have an invariably high influential role influential factor to the treatment outcome which draws the necessity for an endodontic retreatment for better favourable outcomes [5]. The reasons for endodontic failures are due to various factors, which is more commonly due to previous treatment procedures [6,7].

It is already known that there is a correlation which takes place between periapical destruction and improper obturation [8]. It is seen that the voids and unfilled spaces of the root canal play an influential role for infections, especially microorganisms, to easily penetrate and affect the periapical tissues [9]. This could again cause more harm to the patient than benefit them in the long run.

One of the theories that can be used by dental practitioners which have already been proven is Praxic Concept theory (PC), by Kvist et al [10]. This theory suggests that operators in order to assess the periapical health continuity on a scale of "no lesion" and "big lesion" in either extremities can help the operator to assess the periapical health. This helps the operator to grade the disease and the gravity of the lesion suggesting the need for Endodontic retreatment in clinical scenarios [11].

Different authors have suggested two modalities of endodontic retreatment. One an orthograde approach and next a retrograde approach (surgically). According to various authors it was seen that an orthograde approach had a much better successful outcome with a success rate seen to be around 80% [12,13].

The decision making process at a postgraduate endodontic program may be different to other employed in a private practice setting due to their different concepts and philosophies, patient and educational requirements and has an influential role in the need for Endodontic Retreatment [14,15].

Our study aims to assess the post obturation quality of Endodontic retreatment by postgraduate students.

Material and Methods

All the data was obtained via Electronic Medical records of Saveetha Dental College, Chennai, India. Demographic data such as patients age, gender, tooth number was obtained. Assessment data was obtained through the database and was manually analyzed by 2 calibrated operators who assessed the radiographs based on 2 criterias. In case of disagreement a third operator was asked to reach a conclusion for the same.

The criterias assessed were the following

A) Length of the root canal filling

B) Quality of the root canal filling

The assessment was done and the scoring criteria was done by criteria given by Hommez et al [16]. The length of root filling scoring criteria (A) was assessed from score 1-3

1) 1- Root filling terminating 0-2mm short of radiographic apex (acceptable)

2) 2- Root filling terminating >2mm from the radiographic apex (unacceptable)

3) 3- Root filling extending beyond the radiographic apex (unacceptable)

Quality of the root filling (B) was divided into score 1-2

1) 1- Homogenous root filling, good condensation, no voids, visible(acceptable)

2) 2- Inhomogenous root filling, poor condensation, voids visible

A total sample of 280 was recorded from the time frame June 2019 to March 2020. From all the duplicate entries, incomplete entries and samples subjected to inclusion criteria, a total sample size of 227 was achieved

The inclusion criteria being -

1) Patients aged 18-70 years

2) Tooth subjected to only endodontic retreatment

The exclusion criteria being -

Patients below age 18 and above age 70 years

Incomplete data

Patients with some records missing were excluded

Results and Discussion

The statistical analysis was carried out using SPSS 21.0 (IBM Corp, USA). Demographic data such as patient gender, tooth number, age was recorded and the results showed length of root canal filling showing 60% being acceptable and 70% the quality of obturation was seen to be unacceptable. A chi square test was done to assess the potential outcome predictors with level of significance set at 0.05 and ($p<0.005$), a statistically significant difference was seen

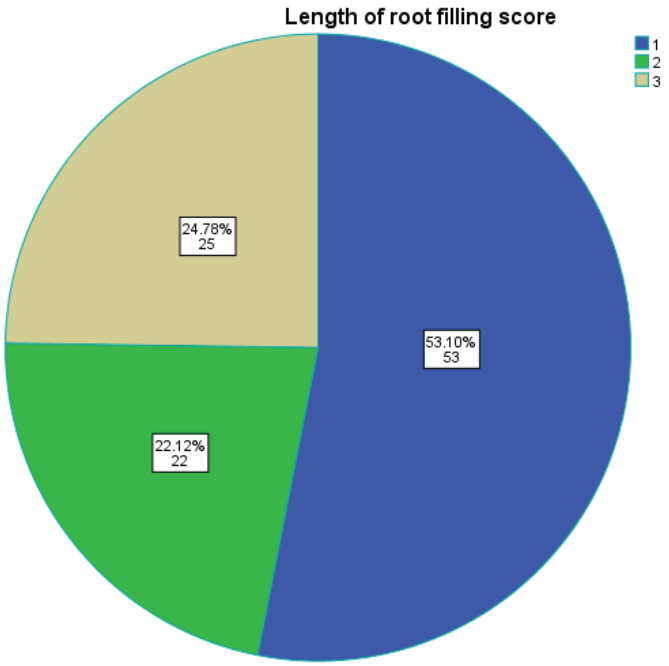

Figure 1: Pie chart denotes the frequency of distribution based on the length of root canal filling in Endodontic Retreatment cases. Blue color denotes Score 1- Root filling terminating 0-2mm short of radiographic apex (acceptable), Green color denotes Score 2- Root filling terminating >2mm from the radiographic apex (unacceptable), Yellow color denotes Score 3- Root filling extending beyond the radiographic apex (unacceptable). The frequency distribution of the length of root filling was seen to be highest for Score 1 - 53 (53.10%), followed by Score 2 - 22 (22.12%) and Score 3 - 25 (24.78%).

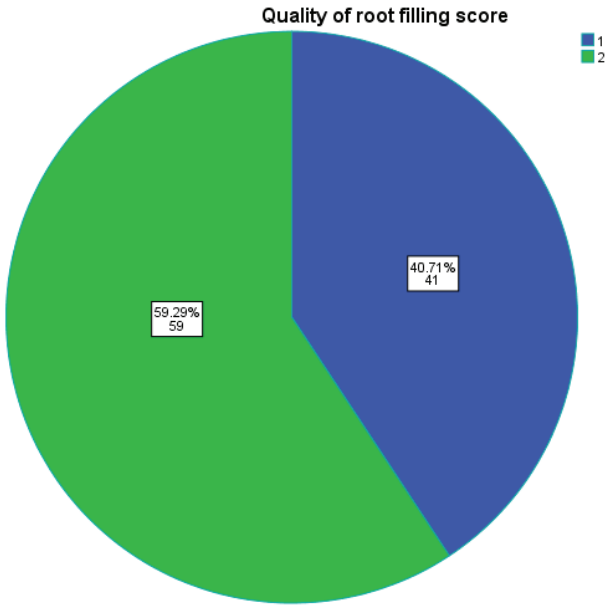

Figure 2: Pie chart denotes the assessment of quality of root canal filling in Endodontic Retreatment cases. Green color denotes Score 1- Homogenous root filling, good condensation, no voids, visible(acceptable). Blue color denotes Score 2- non homogenous root filling, poor condensation, voids visible. The frequency distribution of the quality of root filling was seen to be highest for Score 2 - 59 (59.29%) followed by Score 1 - 41 (40.71%)

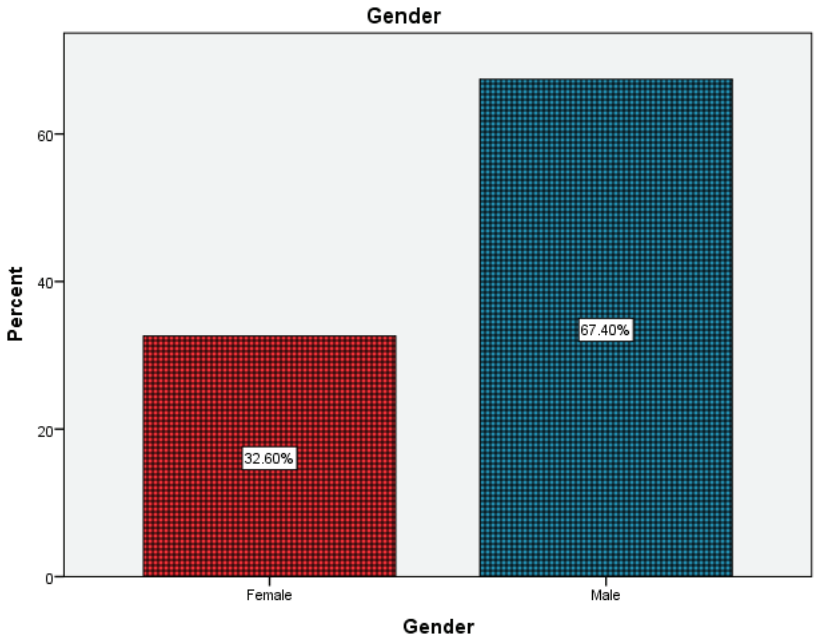

Figure 3: Bar chart denotes the Gender distribution for Endodontic Retreatment with X axis denoting the gender and Y axis denoting the percentage. From the data assessed it was seen that the male population was seen to be 153 (Blue) (67.4%) and female population being 74 (32.6%)(Maroon)

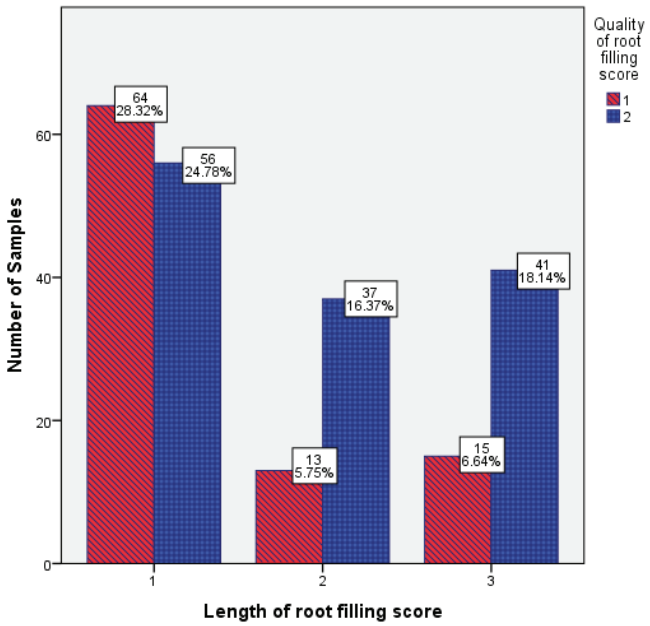

Figure 4: Bar chart denotes the association between the length and quality of the root filling. X axis denotes the length of the root filling score and Y axis denotes the frequency distribution of samples. The bar diagram denotes the frequency and its associated percentages Red color denotes Score 1 and Blue Color denotes Score 2 for quality of root filling score. It is seen that higher frequency of distribution is seen in Score 1(length)/Score 1(quality)- 64 (28.32%) denoting adequate quality. Score 1(length)/Score 2(quality) was seen to be next highest 56 (24.78%) denoting the length of root filling was adequate but the quality of root filling was not adequate. Score 2(length)/Score 1(quality) was seen at 13 (5.75%), Score 2(length)/Score 2(quality) at 37 (16.37%), Score 3(length)/Score 1(quality) at 15 (6.64%) and Score 3 (length)/Score 2(quality) at 41 (18.14%). Chi square test was done to analyze the correlation between the length of root filling and quality of root filing and was found be statistically significant (p value =0.000)

Endodontic retreatment consists of various factors such as cleaning and shaping of the previously obturated canals and three dimensional filling of their cleaned space [17,18]. This treatment depends on various factors such as feasibility of the access to the root canal system and the restorability of the teeth in the long run [19].

To successfully accomplish this procedure all the obstructions preventing direct access to the root canal are removed such as dentinal overhangs and the intracoronal restorations and other obstructions within the canal are removed such as root canal filling materials and other foreign objects [20–22]. Followed by this various obturating materials such as semisolid, solid materials are removed such as pastes and cements [23]. Patency filing is achieved till the minor constriction followed by adequate cleaning and shaping is done to reduce the microbial load. For this to be achieved simultaneous usage of both instrumentation and irrigants should be used judiciously in this case scenario [4,24–26].

The use of different GP solvents are advised to be used but only in minute quantities. The commonly used being chloroform, xylene, halothane and shown to have some amount of cytotoxic activity when extruded periapically [27]. Different methods are now currently being followed for gutta percha removal such as retreatment instrumentation, hand/rotary instruments or the use of ultrasonics which have shown better results compared to previous known methods [28].

In our results it was seen more endodontic retreatment samples were done on Male and commonly were done on anterior teeth. More of the retreatment was done in the age group above 45 years old. All these have an influential role was given by Imura et al [29] who stated that the outcome of success of endodontic treatment varied considerably with age factors playing a crucial role in periapical healing, also other factors they had noticed was the presence of flare-ups in most infected teeth [30,31]. It was also seen that age had a role in which the more the age increased, the lesser the healing of periapical lesions due to lesser mechanism of body's resistance to pathogens as described by Estefan et al [32].

The increased usage of Intracanal medication is crucial for Endodontic retreatment case scenarios such that it was seen to use full strength NaOCl irrigation in infected canals that fail to completely disinfect the infected root canal dentin [33–36]. Sjogren et al [37,38] has suggested the usage of (Ca(OH2)) paste as a 7-day dressing has shown to eliminate bacteria which survived even after the mechanical preparation [39]. Due to this it is always advised to do a two visit treatment as suggested by Yoldas et al [40] who have shown to have lesser postoperative complications in their multivisit therapy.

In our study we had done a association analysis based on the analysis done it was seen a statistically significant difference was seen between the length of filling and quality of filling score and hence proves that even if the length of root canal filling was achieved the quality of root canal filling also plays a crucial role in the prognosis of endodontic treatment in long run. This was supported by Alves et al [41] in their prospective study which showed higher incidence of endodontic flare ups in obturations with voids. This all findings were in agreement with common findings of all previous studies to be done in a postgraduate assessment

Study Limitations

1) More assessment criteria can be done for better quantitative analysis

2) Skill of an operator had an influential outcome in our study

Future Scope

1) More grading sample required

2) A prospective based sample would give better results of the long term prognosis which is crucial for the validation of treatment

Conclusion

From the results achieved, it is seen that the quality of the obturation was seen to be far from optimal despite the desired root length filling length being achieved by postgraduate students. This could be due to various endodontic complications which could have hindered the outcome and influence the obturation quality. More emphasis should be done in the postgraduate program to handle this case scenario since it is one of the most difficult treatments carried out by the specialist. This can be achieved by the mastery of various techniques and more emphasis on the programs which could prove beneficial in the long run and also help them treat any refractory endodontic disease.

Acknowledgments: None

Conflict of Interest: None of the authors have a

conflict of interest

Source of Funding: Self

Ethical Clearance

It is taken from "Saveetha Institute Human Ethical Committee" (Ethical Approval Number- SDC/SIHEC/2020/DIASDATA/0619-0320)

References

1. The outcome of endodontic retreatment: a 2-yr follow-up [Internet]. Vol. 196, British Dental Journal. 2004. p. 405–405. Available from: http://dx.doi.org/10.1038/sj.bdj.4811134
2. Salehrabi R, Rotstein I. Epidemiologic evaluation of the outcomes of orthograde endodontic retreatment. J Endod. 2010 May;36(5):790–2.
3. Salehrabi R, Rotstein I. Endodontic Treatment Outcomes in a Large Patient Population in the USA: An Epidemiological Study [Internet]. Vol. 30, Journal of Endodontics. 2004. p. 846–50. Available from: http://dx.doi.org/10.1097/01.don.0000145031.04236.ca
4. Kumar D, Delphine Priscilla Antony S. Calcified Canal and Negotiation-A Review [Internet]. Vol. 11, Research Journal of Pharmacy and Technology. 2018. p. 3727. Available from: http://dx.doi.org/10.5958/0974-360x.2018.00683.2
5. Janani K, Palanivelu A, Sandhya R. Diagnostic accuracy of dental pulse oximeter with customized sensor holder, thermal test and electric pulp test for the evaluation of pulp vitality - An in vivo study [Internet]. Vol. 23, Brazilian Dental Science. 2020. Available from: http://dx.doi.org/10.14295/bds.2020.v23i1.1805
6. Bergenholtz G, Lekholm U, Milthon R, Heden G, Odesjö B, Engström B. Retreatment of endodontic fillings. Scand J Dent Res. 1979 Jun;87(3):217–24.
7. Ravinthar K, Jayalakshmi. Recent Advancements in Laminates and Veneers in Dentistry [Internet]. Vol. 11, Research Journal of Pharmacy and Technology. 2018. p. 785. Available from: http://dx.doi.org/10.5958/0974-360x.2018.00148.8
8. Kerekes K. Radiographic assessment of an endodontic treatment method [Internet]. Vol. 4, Journal of Endodontics. 1978. p. 210–3. Available from: http://dx.doi.org/10.1016/s0099-2399(78)80185-x
9. Engström B, Lundberg M. The correlation between positive culture and the prognosis of root canal therapy after pulpectomy. Odontol Revy. 1965;16(3):193–203.
10. Kvist T, Heden G, Reit C. Endodontic retreatment strategies used by general dental practitioners [Internet]. Vol. 97, Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2004. p. 502–7. Available from: http://dx.doi.org/10.1016/j.tripleo.2003.09.006
11. Kvist T, Reit C, Esposito M, Mileman P, Bianchi S, Pettersson K, et al. Prescribing endodontic retreatment: towards a theory of dentist behaviour. Int Endod J. 1994 Nov;27(6):285–90.
12. Molven O, Halse A. Success rates for gutta-percha and Kloroperka N- root fillings made by undergraduate students: radiographic findings after 10?17 years [Internet]. Vol. 21, International Endodontic Journal. 1988. p. 243–50. Available from: http://dx.doi.org/10.1111/j.1365-2591.1988.tb01006.x
13. Allen RK, Newton CW, Brown CE. A statistical analysis of surgical and nonsurgical endodontic retreatment cases [Internet]. Vol. 15, Journal of Endodontics. 1989. p. 261–6. Available from: http://dx.doi.org/10.1016/s0099-2399(89)80221-3
14. Iqbal M, Chan S, Ku J. Relative frequency of teeth needing conventional and surgical endodontic treatment in patients treated at a graduate endodontic clinic--a Penn Endo database study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008 Jul;106(1):e62–7.
15. Jose J, P. A, Subbaiyan H. Different Treatment Modalities followed by Dental Practitioners for Ellis Class 2 Fracture – A Questionnaire-based Survey [Internet]. Vol. 14, The Open Dentistry Journal. 2020. p. 59–65. Available from: http://dx.doi.org/10.2174/1874210602014010059
16. Hommez GMG, Coppens CRM, De Moor RJG. Periapical health related to the quality of coronal restorations and root fillings. Int Endod J. 2002 Aug;35(8):680–9.
17. Friedman S, Stabholz A. Endodontic retreatment--case selection and technique. Part 1: Criteria for case selection. J Endod. 1986 Jan;12(1):28–33.
18. Teja KV, Ramesh S. Shape optimal and clean more. Saudi Endodontic Journal. 2019 Sep 1;9(3):235.
19. McLean A. Criteria for the predictably restorable

endodontically treated tooth. J Can Dent Assoc. 1998 Oct;64(9):652–6.

20. Stabholz A, Friedman S. Endodontic retreatment--case selection and technique. Part 2: Treatment planning for retreatment. J Endod. 1988 Dec;14(12):607–14.
21. Nasim I, Hussainy S, Thomas T, Ranjan M. Clinical performance of resin-modified glass ionomer cement, flowable composite, and polyacid-modified resin composite in noncarious cervical lesions: One-year follow-up [Internet]. Vol. 21, Journal of Conservative Dentistry. 2018. p. 510. Available from: http://dx.doi.org/10.4103/jcd.jcd_51_18
22. Nasim I, Nandakumar M. Comparative evaluation of grape seed and cranberry extracts in preventing enamel erosion: An optical emission spectrometric analysis [Internet]. Vol. 21, Journal of Conservative Dentistry. 2018. p. 516. Available from: http://dx.doi.org/10.4103/jcd.jcd_110_18
23. Jeng H-W, ElDeeb ME. Removal of hard paste fillings from the root canal by ultrasonic instrumentation [Internet]. Vol. 13, Journal of Endodontics. 1987. p. 295–8. Available from: http://dx.doi.org/10.1016/s0099-2399(87)80047-x
24. Sakamoto M, Siqueira JF, Rôças IN, Benno Y. Bacterial reduction and persistence after endodontic treatment procedures [Internet]. Vol. 22, Oral Microbiology and Immunology. 2007. p. 19–23. Available from: http://dx.doi.org/10.1111/j.1399-302x.2007.00315.x
25. Ramamoorthi S, Nivedhitha MS, Divyanand MJ. Comparative evaluation of postoperative pain after using endodontic needle and EndoActivator during root canal irrigation: A randomised controlled trial. Aust Endod J. 2015 Aug;41(2):78–87.
26. Ramanathan S, Solete P. Cone-beam Computed Tomography Evaluation of Root Canal Preparation using Various Rotary Instruments: An in vitro Study [Internet]. Vol. 16, The Journal of Contemporary Dental Practice. 2015. p. 869–72. Available from: http://dx.doi.org/10.5005/jp-journals-10024-1773
27. Chutich MJ, Kaminski EJ, Miller DA, Lautenschlager EP. Risk assessment of the toxicity of solvents of gutta-percha used in endodontic retreatment. J Endod. 1998 Apr;24(4):213–6.
28. Iqbal MK. Nonsurgical ultrasonic endodontic instruments. Dent Clin North Am. 2004 Jan;48(1):19–34.
29. Imura N, Pinheiro ET, Gomes BPFA, Zaia AA, Ferraz CCR, Souza-Filho FJ. The outcome of endodontic treatment: a retrospective study of 2000 cases performed by a specialist. J Endod. 2007 Nov;33(11):1278–82.
30. Imura N, Zuolo ML. Factors associated with endodontic flare-ups: a prospective study. Int Endod J. 1995 Sep;28(5):261–5.
31. R R, Rajakeerthi R, Ms N. Natural Product as the Storage medium for an avulsed tooth – A Systematic Review [Internet]. Vol. 22, Cumhuriyet Dental Journal. 2019. p. 249–56. Available from: http://dx.doi.org/10.7126/cumudj.525182
32. Estefan BS, El Batouty KM, Nagy MM, Diogenes A. Influence of Age and Apical Diameter on the Success of Endodontic Regeneration Procedures. J Endod. 2016 Nov;42(11):1620–5.
33. Bystrom A, Sundqvist G. The antibacterial action of sodium hypochlorite and EDTA in 60 cases of endodontic therapy. Int Endod J. 1985 Jan;18(1):35–40.
34. Siddique R, Sureshbabu NM, Somasundaram J, Jacob B, Selvam D. Qualitative and quantitative analysis of precipitate formation following interaction of chlorhexidine with sodium hypochlorite, neem, and tulsi. J Conserv Dent. 2019 Jan;22(1):40–7.
35. Noor SSSE, S Syed Shihaab, Pradeep. Chlorhexidine: Its properties and effects [Internet]. Vol. 9, Research Journal of Pharmacy and Technology. 2016. p. 1755. Available from: http://dx.doi.org/10.5958/0974-360x.2016.00353.x
36. Manohar M, Sharma S. A survey of the knowledge, attitude, and awareness about the principal choice of intracanal medicaments among the general dental practitioners and nonendodontic specialists [Internet]. Vol. 29, Indian Journal of Dental Research. 2018. p. 716. Available from: http://dx.doi.org/10.4103/ijdr.ijdr_716_16
37. SJöGREN U, Figdor D, Spångberg L, Sundqvist G. The antimicrobial effect of calcium hydroxide as a short-term intracanal dressing [Internet]. Vol. 24, International Endodontic Journal. 1991. p. 119–25. Available from: http://dx.doi.org/10.1111/j.1365-2591.1991.tb00117.x
38. Rajendran R, Kunjusankaran RN, Sandhya R, Anilkumar A, Santhosh R, Patil SR. Comparative Evaluation of Remineralizing Potential of a Paste

Containing Bioactive Glass and a Topical Cream Containing Casein Phosphopeptide-Amorphous Calcium Phosphate: An in Vitro Study [Internet]. Vol. 19, Pesquisa Brasileira em Odontopediatria e Clínica Integrada. 2019. p. 1–10. Available from: http://dx.doi.org/10.4034/pboci.2019.191.61

39. Ramesh S, Teja K, Priya V. Regulation of matrix metalloproteinase-3 gene expression in inflammation: A molecular study [Internet]. Vol. 21, Journal of Conservative Dentistry. 2018. p. 592. Available from: http://dx.doi.org/10.4103/jcd.jcd_154_18

40. Yoldas O, Topuz A, Sehnaz Isçi A, Oztunc H. Postoperative pain after endodontic retreatment: Single- versus two-visit treatment [Internet]. Vol. 98, Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2004. p. 483–7. Available from: http://dx.doi.org/10.1016/j.tripleo.2004.03.009

41. Alves V de O, de Oliveira Alves V. Endodontic flare-ups: a prospective study [Internet]. Vol. 110, Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2010. p. e68–72. Available from: http://dx.doi.org/10.1016/j.tripleo.2010.05.014