



Comparative Evaluation of The Type of Sealer Used For Obturation of Single Visit Root Canal Treated Maxillary and Mandibular Posterior Teeth- A Retrospective Analysis

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ABSTRACT

Single visit root canal therapies are indicated when no periapical changes are appreciated. The final stage of the root canal treatment deals with the filling of the canal system with a biocompatible material. Obturation comprises a core filling material and a sealer. The study aimed to evaluate the type of sealer used for obturation of posterior teeth treated in a single visit and to correlate the sealer use with factors like tooth, gender and operator qualification. The study was a retrospective analysis. A total of 86,000 case sheets were reviewed and necessary data was extracted. The type of sealer used for the obturation was assessed and tabulated along with details like age, gender and tooth. The data was exported to IBM SPSS Software 20. Frequency distribution tables were created and a Chi-square test was performed to check for the correlation of the type of sealer used with various parameters. A total of 1209 molar cases were treated out of which 34.5% were maxillary first molars. The endodontic sealers that have been reported to be put to use are zinc oxide based, resin-based, calcium hydroxide based, medicated, 3 sealer, 4 sealer & others. Maximum cases (53.5%) were treated with a resin-based sealer. A positive correlation (p-value <0.05) is found between the use of sealer and operator qualification. Within the limitations of the study, a variety of root canal sealers were found to have been used for obturation and a positive correlation between the operator qualification & type of sealer used for obturation of molars in single visit RCTs was found.



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INTRODUCTION

Pain happens to be the most common presentation of the patients with tooth or teeth related problems (Hargreaves and Keiser, 2004). It can be considered as a protective mechanism that notifies the body of a harmful stimulus, and is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage (Swieboda, 2013; IASP, 2017). Dental caries and trauma are amongst the leading causes of dental pain which indicates pulpal and/or periapical inflammation and infection (Nair, 2004; Jose et al., 2020).

The diagnosis depends on history, clinical signs and symptoms, response to pulp sensibility tests and radiographic analysis to evaluate for calcifications (Kumar and Antony, 2018; Rajakeerthi and Nivedhitha, 2019; Janani *et al.*, 2020). Based on the diagnosis, a treatment plan is formulated. Endodontic therapy if indicated may be performed in single- or multi-visit and it involves the removal of inflamed/infected pulp, removal of microorganisms, maximal disinfection of the canal space using chemicals of either natural or artificial origin in the form of intracanal irrigants and/or medicaments (Sureshchandra and Gopikrishna, 2014; Ramamoorthi *et al.*, 2015) and modern technology to prevent reinfection, minimal biomechanical preparation of the root canals to prevent reinfection (Siddique *et al.*, 2019; Ramesh *et al.*, 2018; Ramanathan and Solete, 2015) & failures and filling of these canal spaces with a biocompatible material (Noor and Pradeep, 2016; Manohar and Sharma, 2018; Teja and Ramesh, 2019). Final restorations with restorative resins, veneers or laminates, various types of crowns are imperative to provide function and prevent reinfection by constant seeping of saliva and microorganisms (Hussainy, 2018; Ravinthar and Jayalakshmi, 2018). To prevent caries progression to an extent where it involves the dental pulp such that endodontic therapy is necessitated, use of remineralising agents is widely being tried, tested & evaluated as a preventive measure and has shown clinical success (Nasim and Nandakumar, 2018; Rajendran, 2019). The principle objective of performing a root canal treatment is to prevent extraction of the affected tooth & to maintain the arch integrity (Lee, 2009).

The endodontic therapy presents with cleaning and shaping of all the canals along with the sealing of the canal space with a biomaterial. Poor obturations most often present with re-infection and hence uniform cleaning with the sealing of the canal space is essential (Ng, 2008). An ideal obturation is free of voids, ends within 2 mm of the anatomic apex and provides a 3-dimensional hermetic seal by blocking all the various types of canals (apical, lateral and furcal) (Akdeniz *et al.*, 2007).

Obturation requires a core material that is coated with a sealer. The root canal sealers are necessary to fill the voids & irregularities in the root canal, lateral & accessory canals, and spaces between gutta percha points used in lateral condensation technique. To serve as a lubricant during the obturation process & seal the space between the dentinal wall and obturating core interface (Marín-Bauza, 2012).

Various sealers commonly used in endodontics

include zinc oxide eugenol, calcium hydroxide sealers, resin sealers, silicone sealers and bioceramic sealers (Orstavik, 2005). The combination of obturating techniques and endodontic sealer provides a 3-dimensional seal of the root canal space (Orstavik, 2005).

The current study aimed to evaluate the type of sealer used for obturation of posterior teeth treated in a single visit and to correlate the sealer use to factors like tooth, gender and operator qualification.

MATERIALS AND METHODS

The current study was performed in the University setting at Saveetha Dental College, Saveetha University, Chennai, India. An institutional committee approval has been obtained as the study required access to personal data of the patients. The population considered for the study were patients requiring the endodontic therapy irrespective of single or multi-visit root canal therapy. It was a retrospective analysis. The data from a period of June 2019 to March 2020 was accessed. A total of 86,000 case sheets were reviewed. All the case sheets were reviewed by 2 reviewers and cases where single visit root canal treatment of maxillary and mandibular posteriors were performed were included in the study. Cases where multi-visit RCTs and single visit RCTs on anteriors and premolars were excluded from the study. The samples included both male and female patients, within the age groups of 18 to 70 years. Cross-verification was done to minimize sampling bias. The type of Endodontic sealer used for obturation was noted down. All the data was entered in Microsoft excel. Incomplete data was verified from the concerned patient's case sheet or the operator and filled accordingly or otherwise excluded from the study. The entered data was exported to IBM SPSS Software 20. Data analysis was done. Frequency distribution and Chi-square test were performed in order to determine the frequency by which various sealers were used to obturate. Correlation between the type of clinic and sealer used, tooth number and sealer used, type of sealer and tooth, gender and age of the patient was to be deduced. The results were presented in the form of tables and charts.

RESULTS AND DISCUSSION

The frequency distribution of the molar treated by single visit RCTs revealed that the maximum number of cases was that of maxillary first molars (34.5%) and the least is maxillary third molars (0.4%) Table 1. The sealers commonly used for obturation are zinc oxide based, resin based, cal-

cium hydroxide based, medicated sealer, 3 sealer/4 sealer and others with the maximum number of cases being obturated by resin sealer (53.5%) Table 2. A positive correlation between the operator qualification and the sealer used is found with 54.8% of the cases in the post graduate department being treated with resin sealer Figure 1. No significant correlation between the tooth number, gender and age is found with the sealer used Figures 2 and 3 & Figure 4. In the current study, we observed that there is a significance between the qualification of the operator and the type of sealer used for the obturation of a single visit- root canal treated molars. (p-value <0.05; Chi-Square test) Figure 1.

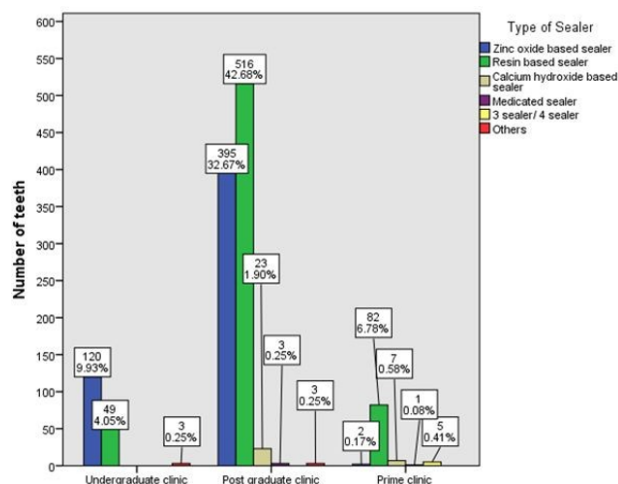


Figure 1: Bar graph represents the association between the type of clinic and the number of teeth

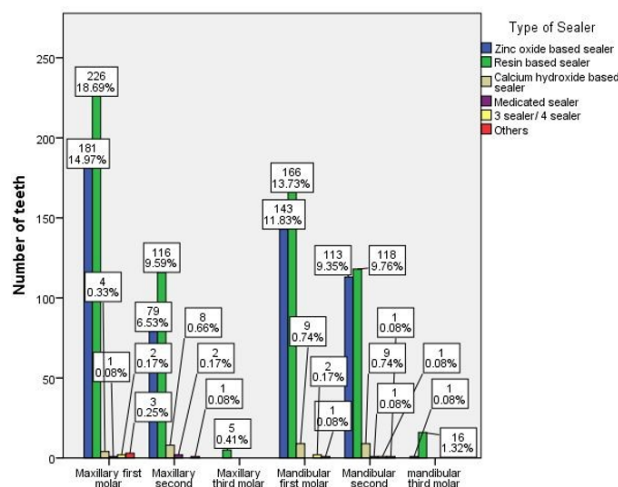


Figure 2: Bar graph represents the association between the type of the tooth and the number of teeth

No significant association of age, gender and type of tooth with the type of sealer for obturation of the molars in single visit RCT cases. (p-value >0.05) Fig-

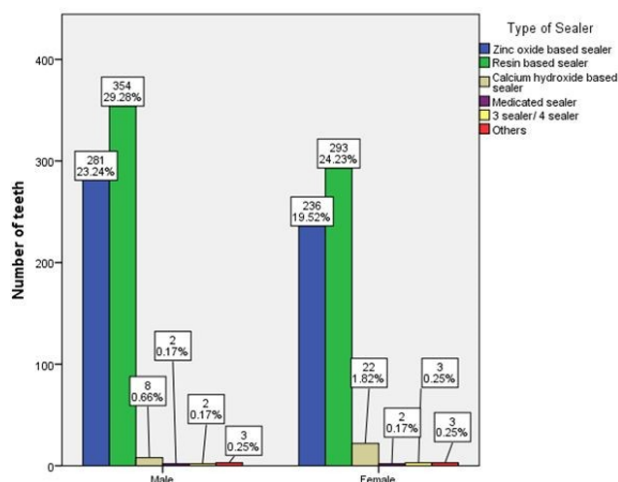


Figure 3: Bar graph represents the association between the gender of the patient and the number of teeth obturated in a single visit RCT

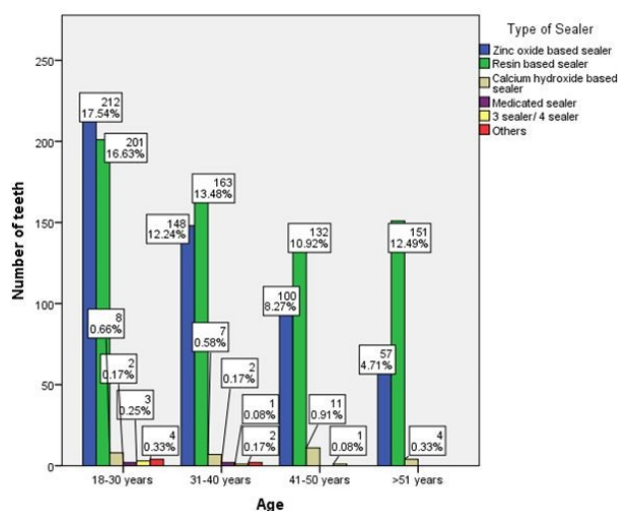


Figure 4: Bar graph represents the association between the age of the patient and the number of teeth obturated in a single visit RCT

ures 2, 3 and 4. Resin based sealer has been used to seal or coat gutta percha in 647 cases (53.5%). In the postgraduate clinic, 516 teeth (54.8%) were obturated using resin based sealer. Most commonly used sealers were resin-based followed by zinc oxide based sealer and calcium hydroxide based sealer. Microleakage is seen to occur no matter whatsoever endodontic sealer is used and it is proportional to the time that passes by (Kopper, 2006). In vivo evaluation of the sealing ability of various sealers have shown significantly less microleakage when sealapex or AH Plus are used (Altan, 2018). However, no previous studies correlating the endodontic sealer use with various parameters like age, gender or tooth type was found in the literature. The ideal properties of sealers include establishment of hermetic seal, tackiness when mixed to

Table 1: It denotes the frequency distribution of the molars being treated in a single visit

	Frequency	Percent	Valid Percent	Cumulative Percent
Maxillary first molar	417	34.5	34.5	34.5
Maxillary second molar	206	17.0	17.0	51.5
Maxillary third molar	5	.4	.4	51.9
Mandibular first molar	321	26.6	26.6	78.5
Mandibular second molar	243	20.1	20.1	98.6
mandibular third molar	17	1.4	1.4	100.0
Total	1209	100.0	100.0	

Table 2: It denotes the types of sealers being used for the obturation of teeth being endodontically treated in a single visit

	Frequency	Percent	Valid Percent	Per- cent	Cumulative Percent
Zinc oxide based sealer	517	42.8	42.8		42.8
Resin based sealer	647	53.5	53.5		96.3
Calcium hydroxide based sealer	30	2.5	2.5		98.8
Medicated sealer	4	.3	.3		99.1
3 sealer/ 4 sealer	5	.4	.4		99.5
Others	6	.5	.5		100.0
Total	1209	100.0	100.0		

provide adhesion, lack of shrinkage and staining of tooth structure and radiopacity to be seen on a radiograph (Orstavik, 2005). The root canal sealer should hence be able to create an effective bond between the core material and dentine to prevent microleakage (Kumar, 2011). In the current scenario, epoxy resin based sealers are seen to possess very good physical properties, excellent apical sealing ability and biocompatibility (Singh, 2015). Bondability of resin sealers with dentin is however a little controversial (Tay and Pashley, 2007). AH 26 releases formaldehyde hence its use has been questionable and this resin based sealer is being replaced with AH Plus which is a more biocompatible option (Spångberg et al., 1993; Huang, 2002). Zinc oxide eugenol based sealers have released potentially cytotoxic concentrations of eugenol that affect the viability of periodontal cells (Jung, 2018). Calcium hydroxide based sealers promote calcification but dissolution over a period of time remains a challenge (Khashaba et al., 2009).

It is also reported that AH Plus and Grossman's sealer effectively reduce the number of cultivable cells of *E.faecalis* while calcium hydroxide based sealers are ineffective (Kayaoglu et al., 2005; Anu-

mula, 2012). In a spectrophotometric evaluation of apical sealing ability, it was found that a zinc oxide based sealer (Tubliseal) exhibited least microleakage followed by AH26 and Sealapex (Shetty, 2015). Neither the resin based nor zinc oxide based sealers present with lower bond strength. Hence, it is advisable to use either of the two (Rached-Junior et al., 2014). However, new bioceramic sealers present with excellent bond strength with the dentinal wall (Madhuri, 2016). Hence, the choice of the root canal sealer is important as it helps in provision of an excellent seal that is impervious to moisture and bacteria/bacterial by-products. The limitations of the study were limited sampling and small sample size. The future scope of the current study could be to find an association of the success of the endodontic therapy with root canal sealer used. Also, an association of the radiodensity produced after obturation using a sealer could be evaluated.

In Table 1, The maximum number of teeth that were treated in a single visit were maxillary first molars (34.5%) followed by mandibular first molars (26.6%). In Table 2, it denotes the frequency with which each type of sealer is used for obturation. Most commonly used is resin-based sealer (53.5%)

followed by zinc-oxide based sealer (42.8%).

In Figure 1, X-axis represents the type of clinic and Y-axis represents the number of teeth. Also, blue denotes zinc-oxide based sealer, green denotes resin based sealer, beige denotes calcium hydroxide based sealer, purple denotes medicated sealer, 3 sealer/4 sealer denotes yellow and red denotes others. Chi-square test was done and association was found to be statistically significant. Upon analysis, it can be inferred that the highest number of single visit RCTs are performed by the postgraduate students. Resin based sealer followed by zinc oxide based sealer is used for the obturation of the teeth. Pearson's Chi-square value: 183.776, df: 10, p-value: 0.000 (<0.05) hence statistically significant, proving that significant association between the operator's qualification and the type of sealer used for obturation. Resin based sealer is used in a higher proportion for the obturation of single visit molars by the postgraduates.

In Figure 2, X-axis represents the type of tooth and Y-axis represents the number of teeth. Also, blue denotes zinc-oxide based sealer, green denotes resin based sealer, beige denotes calcium hydroxide based sealer, purple denotes medicated sealer, 3 sealer/4 sealer denotes yellow and red denotes others. Upon analysis, it can be seen that resin sealer is the most widely used sealer for the obturation while maxillary first molar followed by mandibular first molar is the most commonly treated single visit RCT treated teeth. Chi-square test was done and association was found not to be statistically significant. Pearson's Chi-square value : 32.079, df: 25, p-value: 0.156 (>0.05) hence statistically not significant, proving that there is no significant association between the type of tooth and the type of sealer used for obturation.

In Figure 3, X-axis represents the gender of the patient and Y-axis represents the number of teeth. Also, blue denotes zinc-oxide based sealer, green denotes resin based sealer, beige denotes calcium hydroxide based sealer, purple denotes medicated sealer, 3 sealer/4 sealer denotes yellow and red denotes others. Upon analysis, it can be seen that resin based sealer is used more often for obturation of single visit RCT teeth in males than in females. Chi-square test was done and association was found not to be statistically significant. Pearson's Chi-square value: 9.606, df: 5, p-value: 0.087 (>0.05) hence statistically not significant, proving that there is no significant association between the gender of the patient and the type of sealer used for obturation.

In Figure 4, X-axis represents the age of the patient

and Y-axis represents the number of teeth. Also, blue denotes zinc-oxide based sealer, green denotes resin based sealer, beige denotes calcium hydroxide based sealer, purple denotes medicated sealer, 3 sealer/4 sealer denotes yellow and red denotes others. It can be inferred that zinc oxide based sealer is used more commonly in 18-30 years of age group while resin based sealer is used in the 31-40 years age group. Chi-square test was done and association was found not to be statistically significant. Pearson's Chi-square value: 47.857, df: 15, p-value: 0.077 (>0.05) hence statistically not significant, proving that there is no significant association between the age of the patient and the type of sealer used for obturation.

CONCLUSION

Within the limitations of the study, a variety of root canal sealers used for obturation was found. A positive correlation between the qualification of the operator and the type of sealer used for obturating single visit root canal treated molars was found. The clinician must hence not only focus on the correct use of technique but also the material aspect of various products used in endodontic therapy. The success and longevity of an endodontic therapy can be anticipated only when a balanced approach of correct techniques and material use is taken into consideration.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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