



## Frequency, distribution and obturation technique of root canal retreatment among patients attending a teaching dental hospital in Chennai - A retrospective study

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### ABSTRACT

The aim of the study was to determine frequency, distribution and obturation technique of root canal retreatment among patients attending a teaching dental hospital in Chennai from June 2019 to March 2020. Three hundred seventy case records of endodontic retreatment were obtained, 262 met inclusion criteria. Patients above 18 years of age, patients who visited from June 2019 to March 2020 and patients who have already finished root canal treatment and had complaints of pain were included. Data were tabulated into excel sheets under the headings age, gender, teeth no, obturation technique. Then data were analyzed using SPSS software (23.0). The statistical analysis of the data was performed using chi-square test. Out of the 262 case sheets analysed, 64.9% were male and 35.1% were female. Most commonly affected age group was 18-30 years (38.5%), the least affected age group was above 60 years (6.9%). Most commonly affected teeth were 11,21 (26%,11.8%), least commonly involved were 17,27,32,33 (0.4% - 0.8%). Matched taper single cone technique was most commonly used (57.6%) followed by lateral compaction (40.5%), least commonly preferred technique was warm vertical compaction (1.9%). Overall results of the study are statistically not significant ( $P>0.05$ ). Within the limitations of this study, it was concluded that the prevalence of retreatment cases was high in upper anterior teeth followed by lower posterior. Whereas the association of retreatment cases was least in upper posterior and lower left lateral and canines. Incidence of retreatment cases in relation to root canal treated teeth was higher in male among the 18 - 30 year's age group.

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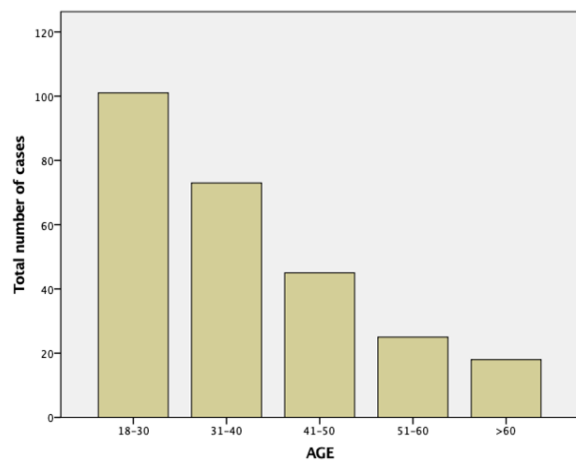
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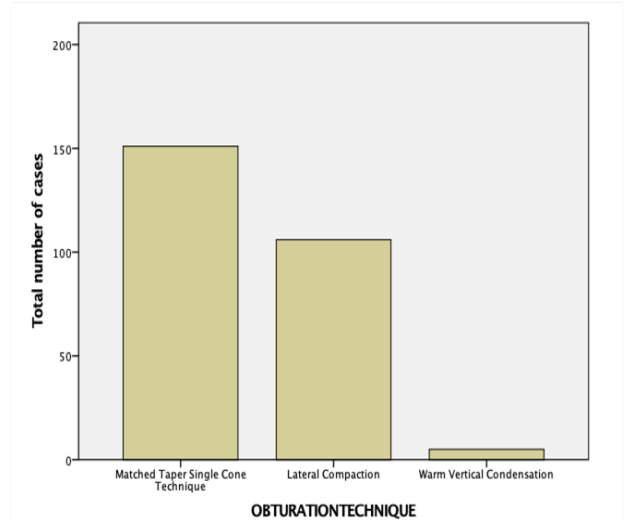
### INTRODUCTION

Nowadays endodontic retreatment is routinely practised in dentistry. Evolution of techniques and materials in endodontics has resulted in saving millions of teeth that would have otherwise led to extraction. Recent advances in prosthodontics, implantology and restorative dentistry have made tooth replacement less difficult compared to the past, a natural tooth with good prognosis is universally accepted and superior choice compared to replacement of the tooth (Hargreaves *et al.*, 2011; Nasim and Nandakumar, 2018).

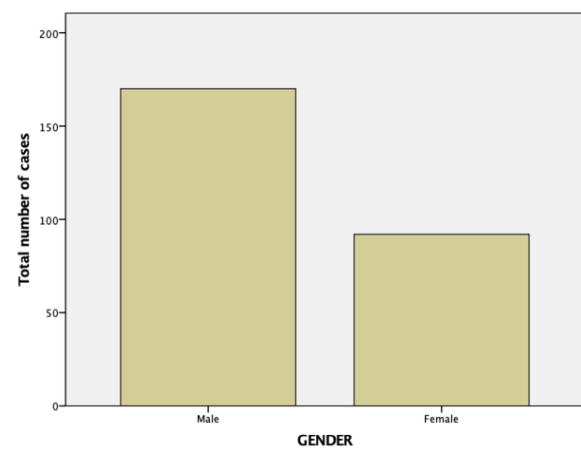
Endodontic retreatment is a procedure to remove



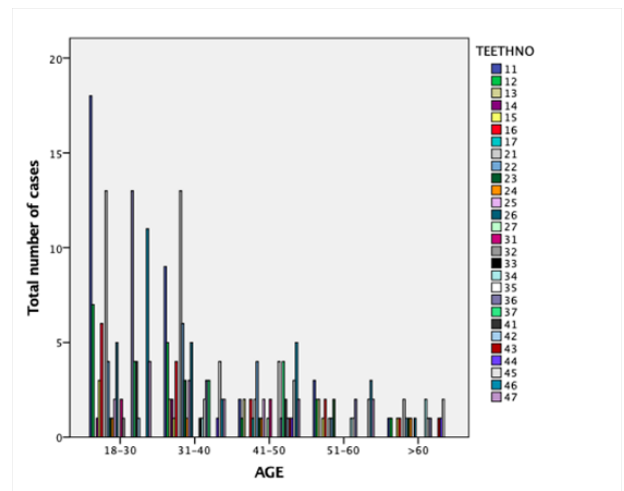
**Figure 1: Age wise distribution of patients undergoing retreatment**



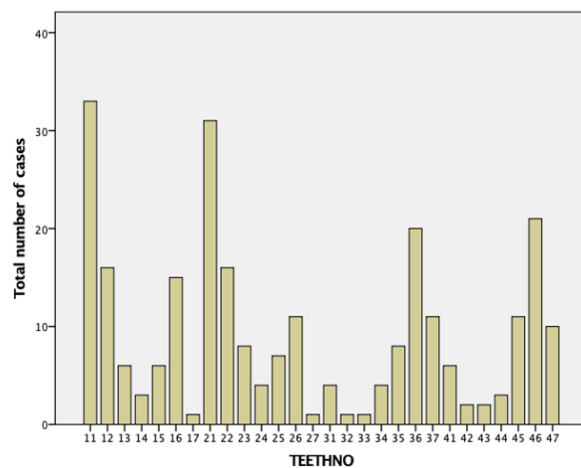
**Figure 4: Obturation technique used in patients undergoing retreatment**



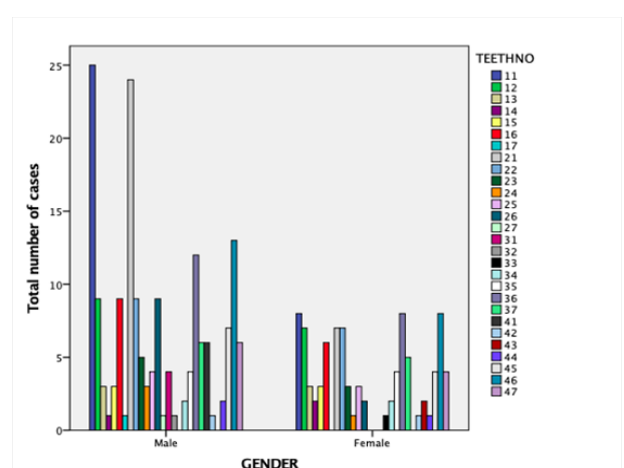
**Figure 2: Gender wise distribution of patients undergoing retreatment**



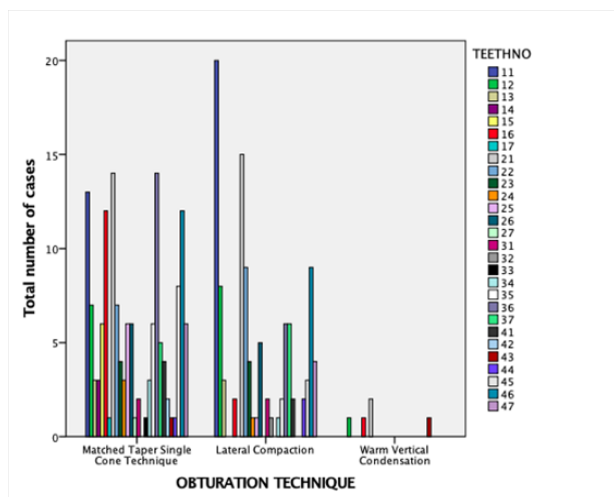
**Figure 5: Association between age of patients and the tooth undergoing retreatment**



**Figure 3: Teeth wise distribution of patients undergoing retreatment**



**Figure 6: Association between the gender of the patients and the tooth undergoing retreatment**



**Figure 7: Association between obturation technique and the tooth undergoing retreatment**

old root canal filling material from the tooth, cleaning and shaping followed by obturation of the canals (Emre *et al.*, 2008). Complete removal of gutta-percha cone and sealer from root canal walls, establishing working length, promoting disinfection, shaping of canal and re-obturing the root canal is the main goals of endodontic retreatment to obtain a successful outcome and re-establish healthy periapical tissues (Emre *et al.*, 2008; Somma *et al.*, 2008).

There are many techniques for removal of gutta-percha from the root canal. It includes the use of heated instrument, gates glidden drills, endodontic hand files, nickel-titanium rotary instruments, ultrasonic instruments, laser, and use of gutta-percha solvents (Ramamoorthi *et al.*, 2015; R and Ms, 2019). Usually removing gutta-percha cones with the help of hand files with or without using solvent can be a difficult and time-consuming process (Engin-Akpinar *et al.*, 2012).

When endodontic retreatment is performed, there may be a periapical extrusion of root canal filling material, root canal sealer, necrotic pulp tissue, dentinal shaving (Ratheesh *et al.*, 2019; Nasim *et al.*, 2018). Periapical extrusion of debris during endodontic retreatment may lead to discomfort and post-operative pain. Apically extrusion of necrotic pulp tissue or root canal filling material are responsible for post-operative pain and endodontic flare-ups and may eventually leading to failure of endodontic retreatment (Engin-Akpinar *et al.*, 2012; Uezu *et al.*, 2010).

Endodontic retreatment is a time consuming and tedious process, some time may lead to procedural errors. Selection of cases for endodontic retreat-

ment is an exacting process where the outcome of the treatment has to be weighed (Ratheesh *et al.*, 2019). The aim of the study was to determine frequency, distribution and obturation technique of root canal retreatment among patients attending a teaching dental hospital in Chennai.

## MATERIALS AND METHODS

This retrospective study included patients who attended Saveetha Dental College and Hospital from June 2019 - March 2020. This study was approved by the Institutional Review Board. Inclusion Criteria - Patients above 18 years of age, patients who visited during a particular time period from June 2019 - March 2020 and patients who have already finished root canal treatment and complaints of pain (retreatment cases)

Exclusion Criteria - Patients below 18 years of age, patients who did not visit during a particular time period from June 2019 - March 2020 and patients who have not undergone any type of endodontic treatment. Data of the patients (retreatment cases) was obtained from case records. A total of 370 cases reported for endodontic retreatment. Out of which 262 were included in the study. Data were tabulated into excel sheets under the headings age, gender, teeth no, obturation technique. Then data were analyzed using SPSS software (23.0). The statistical analysis of the data was performed using chi-square test. Overall results of the study are statistically significant.

## RESULTS AND DISCUSSION

A total of 370 patients (endodontic retreatment cases) reported to dental clinics at Saveetha dental college during the selected time period. Out of which 262 patients met the inclusion criteria and were used for further analysis.

38.5% of included cases were 18-30 years age group, 27.9% were 31-40 years age group, 17.2% were 41-50 years age group, 9.5% were 51-60 years age group and 6.9% were above 60 years of age (Figure 1). X axis represents age in years and Y axis represents total number of cases. Majority of the patients were in the age group of 18 to 30 years.

In the study group, 64.9% were male and 35.1% were female (Figure 2). X axis represents gender and Y axis represents total number of cases. Majority of the patients were male.

The teeth most commonly involved were 11 - 26% followed by 21 - 11.8%, least commonly involved were 32,33,27,17 (0.4%) followed by 42,43 (0.8%)

(Figure 3). X axis represents teeth number and Y axis represents total number of cases. Majority of the teeth that under went retreatment were maxillary central incisor (11,21), followed by mandibular first molars (36,46).

Most commonly preferred obturation technique was matched taper single cone technique 57.6% followed by lateral compaction (40.5%), least commonly preferred technique was warm vertical compaction (1.9%)(Figure 4). X axis represents obturation technique and Y axis represents total number of cases. Majority of the teeth undergoing retreatment were obturated with matched taper single cone technique.

Association between the age of patients, the gender of the patient, obturation technique and the tooth undergoing retreatment was analysed. Association between the age of patients and the tooth undergoing retreatment was analysed using Chi-square test (P-value - 0.081) and was found to be insignificant. (Pearson Chi-square test; p-value >0.81, p-value >0.05, insignificant). However, among the age groups 18 – 30 yrs, 31 – 40 yrs, the most common tooth retreated was 11 and 21 Figure 5 shows that The X-axis represents age in years and the Y-axis represents the total number of retreatment cases. Association was analysed using the Chi-square test (P-value - 0.081) and was found to be insignificant. (Pearson Chi-square test; p-value >0.81, p-value >0.05, insignificant). However, among the age groups 18 – 30 yrs, 31 – 40 yrs, the most common tooth retreated was 11 and 21. Association between the gender of the patients and the tooth undergoing retreatment was analysed using the Chi-square test (P-value - 0.621) and was found to be insignificant. (Pearson Chi-square value - 24.164, p-value - 0.621, p-value >0.05, insignificant). However, the majority of the male patients underwent retreatment in 11 and 21. Majority of the female patients underwent retreatment in 11, 36, 46 Figure 6 shows that The X-axis represents gender and Y-axis represents the total number of retreatment cases. Association was analysed using the Chi-square test (P-value - 0.621) and was found to be insignificant. (Pearson Chi-square value - 24.164, p-value - 0.621, p-value >0.05, insignificant). However, the majority of the male patients underwent retreatment in 11 and 21. Majority of the female patients underwent retreatment in 11, 36, 46. Association between obturation technique and the tooth undergoing retreatment was analysed using the Chi-square test (P-value - 0.089) and was found to be insignificant. (Pearson Chi-square value - 68.434, p-value - 0.089, p-value >0.05, insignificant). However, the lateral compaction technique was most

commonly preferred for the obturation of 11, 21 Figure 7 shows that The X-axis represents the obturation technique and Y-axis represents the total number of retreatment cases. Association was analysed using the Chi-square test (P-value - 0.089) and was found to be insignificant. (Pearson Chi-square value - 68.434, p-value - 0.089, p-value >0.05, insignificant). However, the lateral compaction technique was most commonly preferred for the obturation of 11, 21.

The major goal of endodontic retreatment is the removal of the root canal filling material, cleaning and shaping, three-dimensional obturation of the root canal to promote periapical healing and retain the tooth for a longer duration. Although endodontic retreatment has shown a high success rate, failure of endodontic retreatment may be due to non-procedural and procedural errors (Engin-Akpinar *et al.*, 2012; Uezu *et al.*, 2010).

In comparison with root canal treatment, non-surgical endodontic retreatment may lead to more periapical extrusion of debris (Krishnamachari *et al.*, 2020). During endodontic retreatment, there may be a periapical extrusion of root canal filling materials, necrotic pulp tissues, dentinal shaving or root canal sealer. Periapical extrusion of debris will lead to failure of apical tissue healing which will cause postoperative inflammation and lead to endodontic flare-ups and failure of treatment (Engin-Akpinar *et al.*, 2012; Uezu *et al.*, 2010).

A study was conducted by Kvist T *et al.*, to know the success rate of non-surgical endodontic retreatment and surgical endodontic retreatment. Statistically, there was no significant difference between the success rate of surgical endodontic retreatment and non-surgical endodontic retreatment; Most of the operator's preferred non-surgical endodontic retreatment treatment for failed endodontic cases as surgical endodontic retreatment procedure resulted in more postoperative pain, discomfort to the oral tissues (Kvist and Reit, 2002). The failure of endodontic therapy occurs due to not following proper treatment protocol (Moor *et al.*, 2000; Seltzer *et al.*, 1963; Siqueira *et al.*, 2014). Failure of endodontic therapy is mostly due to persistent microbial infection in the periradicular tissue and root canal (Sundqvist *et al.*, 1998; Nair *et al.*, 1990). The most common factors responsible for endodontic treatment failure was missed canal's, periapical extrusion of gutta-percha and under obturated root canal. These findings are similar from other studies, proving the quality of the root canal obturation has an influence on the prognosis of endodontic treat-

ment (Lin *et al.*, 1992; Manohar and Sharma, 2018). Under Obturation of the root canals (root canal filling material more than 2 mm shorter of the radiographic apex) often occurs as the result of inaccurate working length determination, incomplete cleaning and shaping of root canal, which in turn leads to failure of endodontic treatment (Ramesh *et al.*, 2018). Chugal *et al.* found in their study that loss of 1 mm of working length, it will increase the chance of failure of endodontic treatment by 14% in the teeth with apical periodontitis. The cause of periradicular tissue inflammation is due to periapical extrusion of necrotic pulp tissues and over instrumented and underfilled root canal system (Nie and Lin, 1999). Missed root canals were the second most common factor, responsible for the failure of endodontic treatment (Teja and Ramesh, 2019). An unfilled root canal may be missed by the operator during the root canal treatment, or the operator may not be able to locate these root canals during the endodontic treatment (Noor and Pradeep, 2016). Age is an important factor for the high success rate of endodontic treatment. It was found that most of the endodontic failures occurred in the 41-50 years age group of patients, while 21-30 year age group patients had the least endodontic treatment failures. Reason for the high failure rate of endodontic treatment in 41-50 age group patients may be due to calcified canals (Ratheesh *et al.*, 2019; Nasim and Nandakumar, 2018; Dhinesh and Antony, 2018). Second reason may be the uncooperative behaviour, the poor oral hygiene maintenance and low literacy rate.

Intraoral periapical (IOPA) radiograph can be used for assessment of dislodged/fractured restorations, quality of obturation, missed canal, presence of a periapical lesion, iatrogenic problems: root canal perforation, ledges formation and file separation etc. (Ramanathan and Solete, 2015). Root canal treatment failure may be dependent on the location of tooth in the arch. In this aspect, most endodontic treatment failures occur in upper and lower posterior teeth. Endodontic treatment failure in the multirooted teeth is due to missed canals or under obturated canal's and periapical extrusion of obturating material canals of the root canal (Ravinthar and Jayalakshmi, 2018). The high endodontic failure rate of mandibular incisors is due to the presence of an additional root canal which is left untreated during endodontic treatment, which make endodontic treatment difficult for these teeth by General practitioners (Riluwan *et al.*, 2019). Noor N *et al.* found similar findings in their study. Advanced specialized training, skill and experience of the operator play an important role in the high success rate of endodontic treatment. It was found that single cone

obturation 2% taper gutta-percha led to the failure of endodontic treatment due to improper sealing of the root canal system. This indicates the importance of maintaining the proper working length adequate cleaning and shaping followed by three-dimensional obturation of the root canal which leads to proper healing of periapical tissues (Jose *et al.*, 2020). Ali Çagın Yücel *et al.* in the study concluded that System B and laterally compacted ProTaper Gutta-percha prevent bacterial penetration into the root canal at 30 days. Furthermore, after 60 days, there was no difference among these obturation techniques.

In the present study, we analysed frequency, distribution and obturation technique of endodontic retreatment cases reported to Saveetha dental college. Prevalence of retreatment cases was high among male's 64.9% compared to females 35.1%. Prevalence of retreatment cases was high among 18-30 years age group 38.5% followed by 31-40 years age group 27.9%. It was least among the above 60 years of age group (6.9%). The teeth most commonly involved were 11,21,46 (12.6%) least commonly involved were 17,27,32,33 (0.4% - 0.8%). Most commonly used obturation technique was matched taper single cone technique 57.6% followed by lateral compaction 40.5%, least used obturation technique was warm vertical compaction - 1.9%. Limitations of the study were that the population studied does not represent all the ethnic group (or) population from around the world. Hence cannot be generalized to larger population and subjective error/bias may be present. In the future scope, a study among the larger population can be performed, which in turn will help in designing appropriate treatment planning.

## CONCLUSION

Within the limitations of the study, it can be concluded that the prevalence of retreatment cases was high in upper anterior teeth followed by lower posterior. Whereas the association of retreatment cases was least in upper posterior and lower left lateral and canines. Incidence of retreatment cases in relation to root canal treated teeth was higher in male among the 18 - 30 year's age group.

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The authors declare that they have no funding support for this study.

## Conflict of Interest

The authors declare that they have no conflict of interest for this study.



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