

A RADIOGRAPHIC ASSESSMENT OF OBTURATION LENGTH IN CASES PRESENTING FOR THE RETREATMENT- A RETROSPECTIVE DATA ANALYSIS IN FAILED CASES

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ABSTRACT:

Introduction: Root canal treatment is one of the most commonly performed procedures in a dental office. It is aimed at removing the entire pulpal tissue, debris and microbes and creating a three dimensional fluid impervious seal of the root canal. The failure of root canal treatment can occur due to a number of reasons like underfilling, missed canals, overextended obturation, persistent lesion, etc. Overextended obturation irritates the periapical tissues leading to periapical lesion and possible cystic transformation.

Aim: To find out the radiographic assessment of Obturation length in cases presenting for the retreatment.

Materials and methods:

A total of 1054 patients who had undergone re-RCT were included in the study. The collected data was subjected to data analysis.

Results and discussion: 18-40 (64.86%) years is the most common age group that has undergone the retreatment ; males (58.97%) are the most common gender who have undergone retreatment; maxillary anterior teeth (38.56%) are the most common teeth that has undergone retreatment; Majority of the patients presented with underfilled root canal (>2mm short of the apex) 95.34% (n= 1003); Majority of the RE-RCT was done with H files 43.96% (n=462); p value : 0.519 (>0.05) hence not statistically significant, proving that there is no significant association between radiographic obturation length and teeth region; p value : 0.401 (>0.05) hence not statistically significant, proving that there is no significant association between radiographic obturation length and age groups.

Conclusion: The present study suggests that vital bleaching has proven to produce satisfactory clinical aesthetic outcome. This study will shed light for future studies that study an even larger population prospective RCTs are needed to further support our evidence.

Keywords: Radiograph, obturation, assessment, retreatment, retrospective innovation.

INTRODUCTION:

The prognosis of root canal treatment (RCT) depends on many variables; amongst them is the technical quality of the root filling [1,2]. During the last decade, endodontic therapy went through a fascinating development. The introduction of operating microscopes, rotary nickel titanium instruments, and Protaper enabled the practitioner to better shape the root canal system [3].

The importance of maintaining the original shape of a root canal during and after cleaning and shaping in order to promote periapical healing in endodontic cases has been demonstrated in several studies [4–6]. The clinician's inability to maintain the original shape and to develop the proper taper of canals can result in procedural errors such as ledges and perforations. It has been shown that endodontic treatment success is dependent both on the quality of the obturation and the final restoration [7].

The quality of the endodontic obturation is usually evaluated using radiographic images upon completion. Additionally, during the root canal preparation and obturation phases of treatment, clinical criteria can be identified that are essential for achieving an adequate root canal obturation [8–10].

Several variables affect the technical quality of root fillings, such as the length of the filling material in relation to the radiographic apex, the density of the root filling material (presence of voids), and the taper of the canal. Methods used to evaluate the technical outcome of RCT have been based mostly on radiographic evaluation [11].

Root fillings placed within 0–2 mm of the radiographic apex are associated with less post-treatment disease than those that are filled with a distance more than 2 mm from the radiographic apex [12]. Studies have reported that the length of the root filling, relative to the radiographic apex, significantly affected the outcome of RCT with 87-94% healing rates associated with root filling ending 0–2 mm from the radiographic apex. Lower healing rates were associated with 'short' root fillings ending more than 2 mm from the radiographic apex (68–77.6%) and with long fillings extruding beyond the apex (75–76%)[13][14]

The correlation between density of the root filling and prognosis is not as clear as the proximity of the root filling to the radiographic apex. Several studies have reported no difference in prognosis between adequately and in adequately compacted root fillings [10,15]. Whilst others have found that a root filling that is less dense and non homogeneous will have a negative impact on the outcome[16].

Canal preparation must flow and progressively narrow in an apical direction starting at the orifice and moving apically, every cross-sectional diameter of the filling material should decrease with the smallest cross-sectional diameter at the apical terminus of the canal [17]. A

continuous taper in the apical third of the shaped canal creates a resistance form for gutta-percha and reduces the potential for overextensions [18].

Several endodontic epidemiological studies had been carried out in different population groups to assess technical quality of root filling in relation to performer experience performed by undergraduate students using standard step back canal preparation technique followed by lateral condensation for canal obturation [19–21][22].

Since then, limited studies have been conducted to relate quality of obturation with different canal instrumentation techniques. Therefore, the aim of the present study was to evaluate the radiographic assessment of obturation length in cases presenting for retreatment in clinical practice.

Our team has extensive knowledge and research experience that has translate into high quality publications[23–32],[33–36],[37–41],[42]

Materials and methods:

Study designs and Study setting

The present study was conducted in the University setting (Saveetha Dental College and Hospitals, Chennai, India). Thus the data available is of patients from the same geographic location and have similar ethnicity. This retrospective study was carried out with the help of digital case records of patients who reported to the hospital. Ethical clearance to conduct this study was obtained from the scientific review board of the hospital.

Sampling:

Data of 1054 patients were reviewed and then extracted. All patients who have undergone retreatment for RCT in the given duration of time period were evaluated. Only relevant data was included to minimize sampling bias. Simple random sampling method was carried out. Cross verification of data for error was done by presence of additional reviewer and by photographic evaluation. Incomplete data collection was excluded from the study.

Data collection

A single calibrated examiner evaluated the digital case records of patients who reported to Saveetha Dental College from June 2019 to March 2021. For the present study, inclusion criteria was data of patients who had undergone retreatment for RCT and whose patients. Data obtained were age, gender, radiographic obturation short from the apex, Reason for retreatment, instrument used for GP retrieval. All obtained data were tabulated into Microsoft excel documents. Statistical analysis The collected data was tabulated and analysed with Statistical Package for Social Sciences for Windows, version 20.0 (SPSS Inc., Vancouver style) and results were obtained. Categorical variables were expressed in frequency and percentage. Chi square test was used to test association between categorical variables. Chi square tests were carried out using age, gender and as independent variables and dependent

variables. The statistical analysis was done by Pearson Chi square test. P value < 0.05 was considered statistically significant.

RESULTS:

FREQUENCY OF DIFFERENT AGE GROUP OF PATIENTS WHO HAVE UNDERGONE RE-RCT

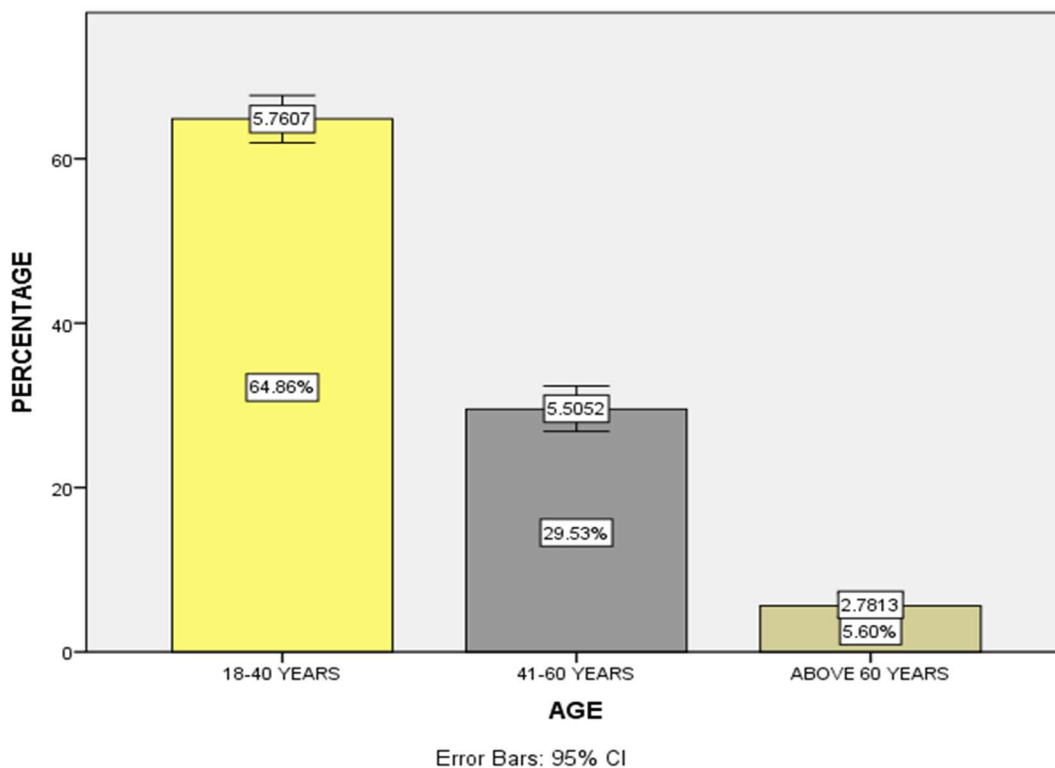


Figure 1 Image representing the frequency distribution of different age groups of patients who have undergone Re-RCT . X-axis shows the different age groups while Y-axis shows the percentage of patients. This graph shows that majority of patients in the age group of 18-40 years have undergone RE-RCT 64.86% (n=683); followed by the age group of 41-60 years 29.53% (n=311); >60 years 5.60% (n=59).

FREQUENCY DISTRIBUTION OF GENDER OF PATIENTS WHO HAVE UNDERGONE RE-RCT

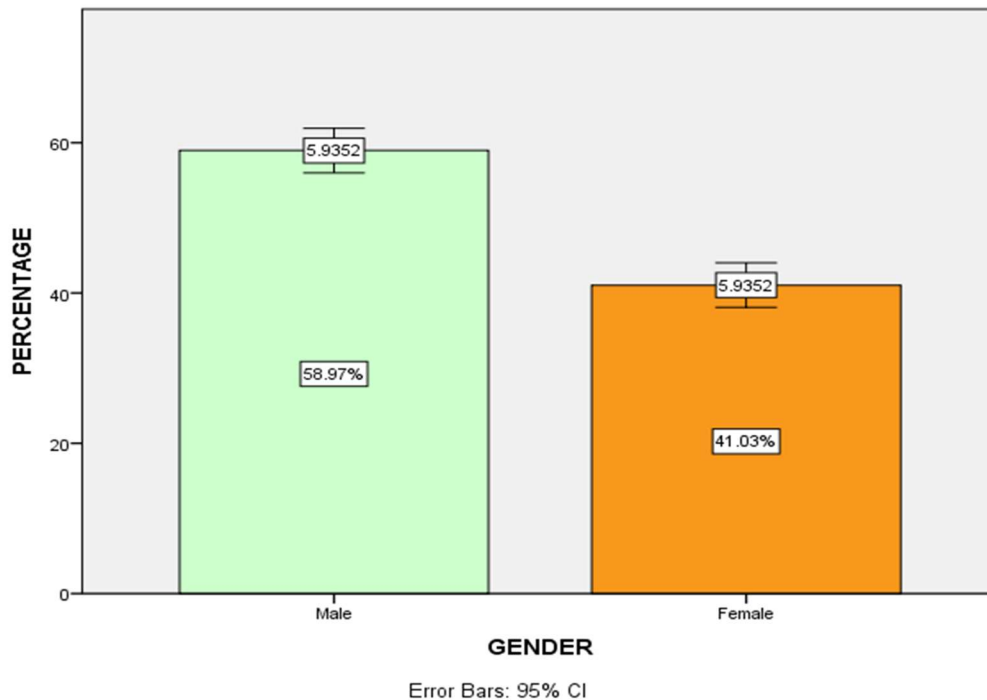


Figure 2 Image representing the frequency distribution of males and females who have undergone RE-RCT. X-axis shows the gender while Y-axis shows the percentage of patients who have undergone RE-RCT. Majority of male patients 58.97% (n=621) have undergone treatment of RE-RCT than male patients 41.03% (n=432).

PERCENTAGE DISTRIBUTION OF TEETH WHICH HAS UNDERGONE RE-RCT

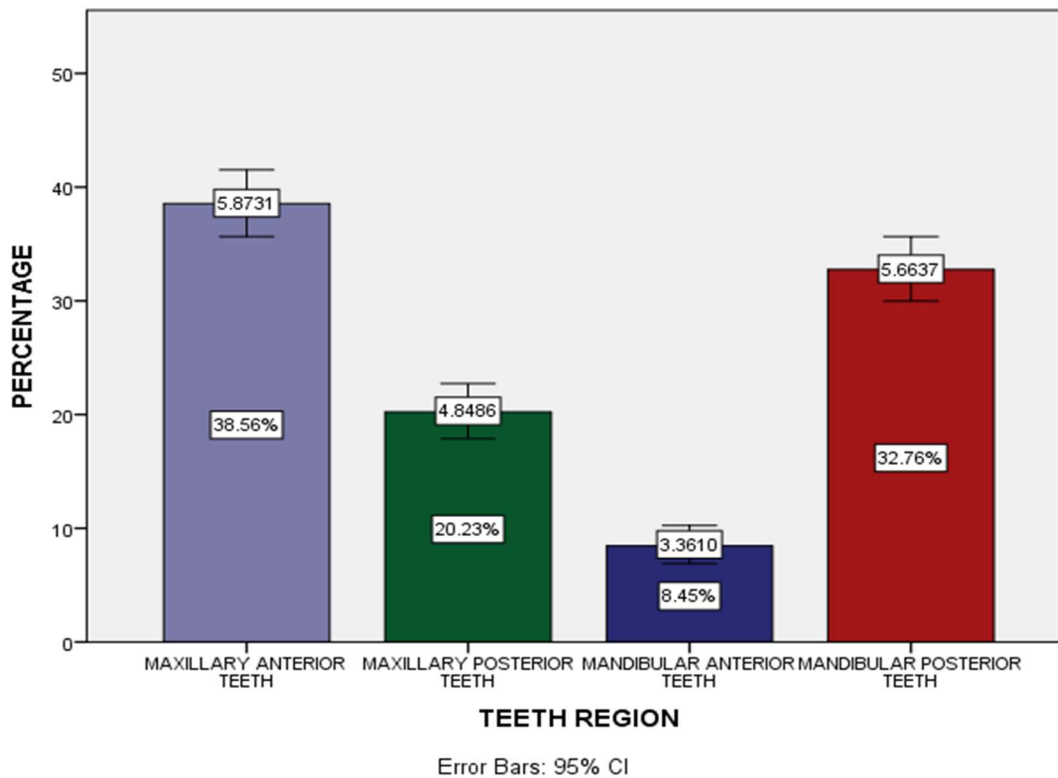


Figure 3 represents the percentage distribution of teeth which has undergone *RE-RCT*. X-axis shows the teeth region, while Y-axis shows the percentage of patients who have undergone *RE-RCT* in different teeth. *RE-RCT* was most commonly undergone in the maxillary anteriors 38.56% (n=406); mandibular posteriors 32.76% (n=345)

PERCENTAGE DISTRIBUTION OF RADIOGRAPHIC OBTURATION LENGTH BEFORE RE-RCT

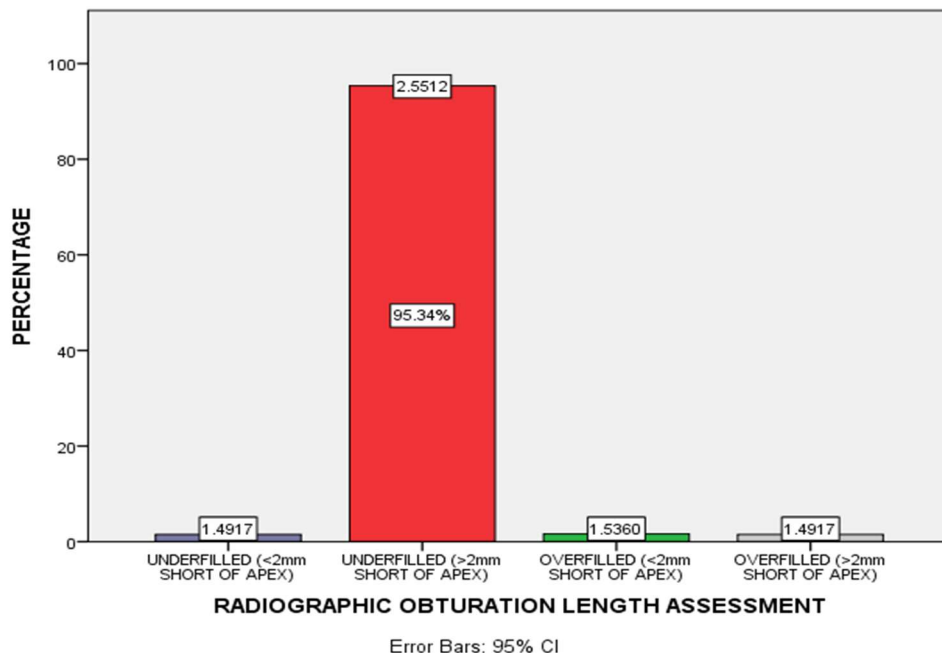


Figure 4 represents the percentage distribution of radiographic obturation length before *RE-RCT*. X-axis shows the underfilled/ overfilled while Y-axis shows the percentage of patients with underfilled/overfilled root canal. Majority of the patients presented with underfilled root canal (>2mm short of the apex) 95.34% (n= 1003)

PERCENTAGE DISTRIBUTION OF DIFFERENT INSTRUMENTS IN WHICH GP RETRIEVAL IS DONE

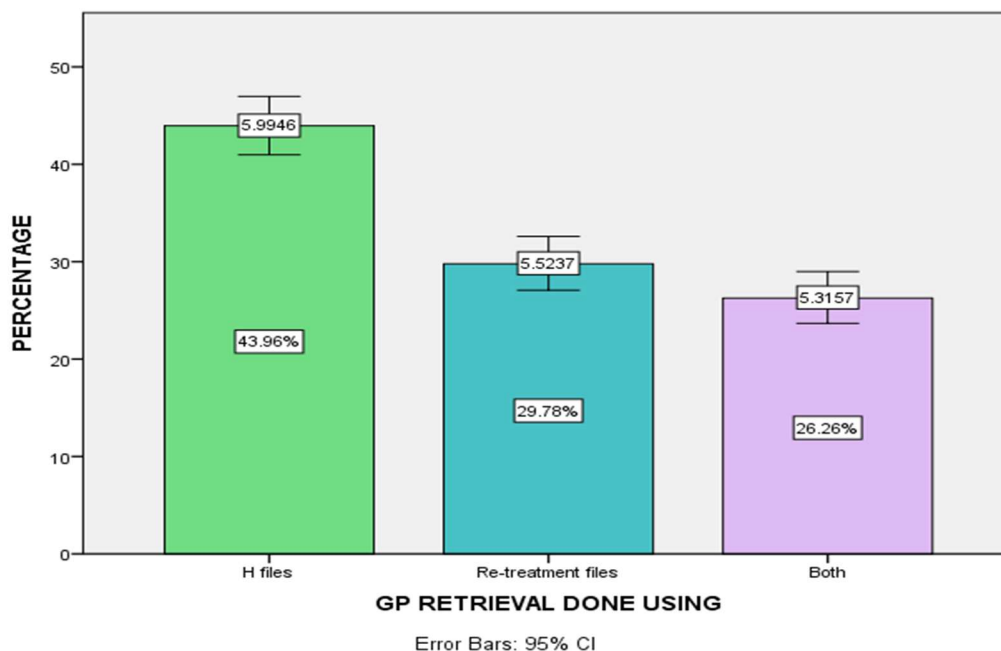


Figure 5 represents the percentage distribution of different instruments in which GP retrieval is done for *RE-RCT*. X-axis shows the instruments while Y-axis shows the percentage of patients in which that instrument is used. Majority of the *RE-RCT* was done with H files 43.96% (n=462); Re treatment files 29.78% (n=313); Both files 26.26% (n=276)

ASSOCIATION BETWEEN RADIOGRAPHIC OBTURATION LENGTH AND TEETH REGION

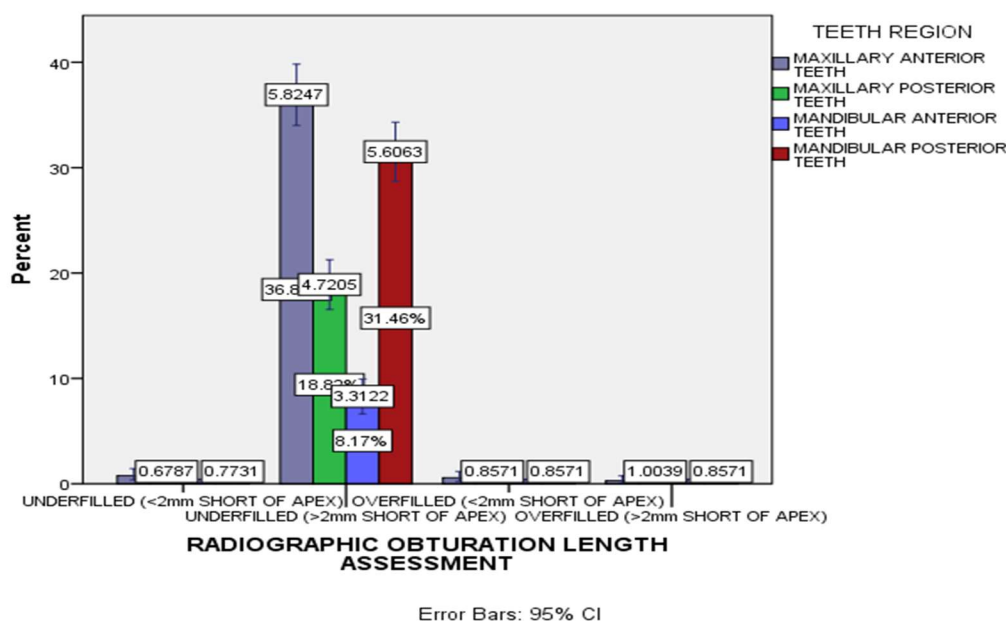


Figure 6 Shows the association between radiographic obturation length and the teeth region. X- axis represents the radiographic obturation length in X cluster and Y- axis represents the teeth region. Chi square test was done and the association was found out to be not statistically significant. Pearson Chi-square value: 8.154, DF: 9, p value : 0.519 (>0.05) hence not statistically significant, proving that there is no significant association between radiographic obturation length and teeth region.

ASSOCIATION BETWEEN RADIOGRAPHIC OBTURATION LENGTH AND AGE GROUPS

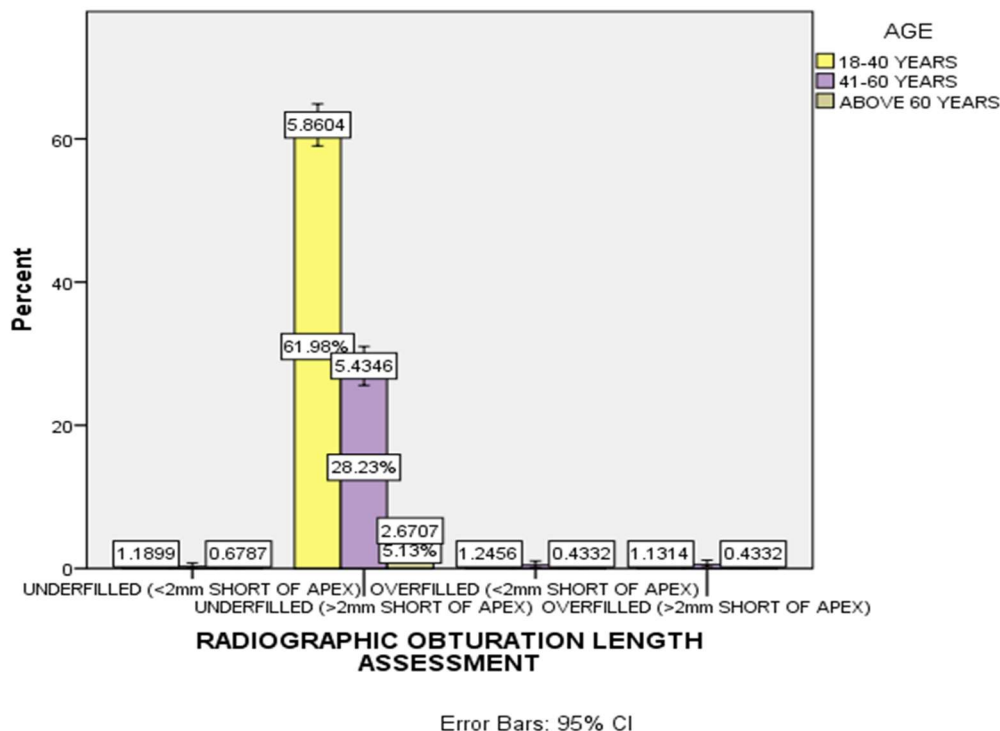


Figure 6 Shows the association between radiographic obturation length and the age groups. X- axis represents the radiographic obturation length in X cluster and Y- axis represents the different age groups. Chi square test was done and the association was found out to be not statistically significant. Pearson Chi-square value: 6.206, DF:6, p value : 0.401 (>0.05) hence not statistically significant, proving that there is no significant association between radiographic obturation length and age groups.

DISCUSSION:

The quality of root canal obturation was the most important factor in the success of the endodontic treatment in a study carried out on endodontically treated teeth. [43] In another study which assessed teeth with endodontic failures, 65% of the cases exhibited poor quality obturation whereas 42% of the teeth had some canals which were left untreated. [44] Success rates are naturally lower for obturations which are under or overextended and are highest for those which end flush or within 2 mm of the apex [45], which is similar to our study where 95.34% patients presented with underfilled (> 2 mm short of apex) According to a study [46], overextended obturation is 4 times more likely to fail than under obturated canals, however it is contradictory to the results of our study. In the presence of an existing periradicular lesion, an overextended root canal filling will have a worse prognosis than a tooth without excess filling material. [47] Moreover in a study[48],an association was found between increased incidence of periapical periodontitis and inadequate or overextended root fillings. However

paradoxical results were reported in a study by Lin et al., in which the apical extent of the root fillings did not seem to have any significant correlation with treatment failures [49].

Literature regarding underfill is far clearer in its condemnation and shows the highest failure rates in teeth filled more than 2 mm short of the radiographic apex . This error may be produced by inadequate length determination, inadequate filling technique, use of inflexible files, variations in canal morphology such as excessive curvature and narrow canals (particularly in molars), inadequate irrigation between each filing, and so forth. Furthermore, sclerotic canals and pulp stones may play a role in increased incidence of underfill in the older age group. Unquestionably, all efforts should be made to avoid this type of procedural error.[50]

Practitioners should show greater care to maintain accuracy of the working length throughout the procedure, as by far errors in length accounted for the vast majority of errors. Special care should be taken when working on molars, which had a significantly higher error rate when compared to anterior teeth or premolars. Emphasis must be placed on community awareness programs to reduce the incidence of caries progressing to the point of requiring endodontic treatment. High risk patients should be provided with prophylactic treatment (such as fissure sealants and fluoride therapy) and regular routine checkups [51,52].

The strength of this study was that the records of patients seen during the period of study were used; therefore there was no issue regarding declined participation from patients and in addition there was no issue regarding improper patient selection. The weakness of the study being a retrospective study, there was no possibility for direct interaction with the patients and the study relied only on the case sheets, clinical photographs and the sample size was also limited and confined to only the South Indian population. However this study will shed light for future studies that study an even larger population prospective RCTs are needed to further support our evidence.

CONCLUSION:

According to the results of the study it can be concluded that underfilled obturation (>2mm short of apex) is the most common reason for retreatment. H-files are most preferred for GP retrieval in retreatment cases due to overextended obturation. Practitioners should show greater care to maintain accuracy of the working length throughout the procedure, as by far errors in length accounted for the vast majority of errors.

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CONFLICT OF INTEREST:

All the authors declare that there was no conflict of interest in present study.

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