

Correlation Of Taper And Preparation Sizes To Radiographic Sealer Extrusion In Mandibular First Molars

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ABSTRACT:

Introduction:

Endodontic therapy is performed to clean the root canal system, alleviate pain and eliminate infection from the tooth. Root canal obturation serves the main purpose of impeding the traffic of fluids from the periradicular tissues or saliva into the canal as well as bacteria and their virulence factors and antigens from the canal to the periradicular tissues. Ideally, the filling material should reach to the apex of the root, without extending into periapical tissues or other neighboring structures.

Aim:

The aim of the present study is to correlate the taper and preparation size with sealer extrusion in lower mandibular molars.

Materials and method:

A total of 50 patients were retrospectively reviewed from June 2020 March 2021 and included in the study. Demographic details like age, gender and dental status of all the patients were recorded. All the data were entered in the excel sheet. Data was analysed by SPSS software. Chi square test was used to find association between the study variables, where $P < 0.05$ was considered statistically significant.

Result:

A total of 50 patients of the 16 to 65 year age group were examined among them 52% were males and 48% were females and the most commonly affected age group by root canal treatment sealer extrusion belonging to 18 to 36 years of age. The most commonly used obturation technique was matched taper single cone techniques with 50% and sealer used was resin sealer (64%). Matched taper single cone technique was the most common type of obturation technique among 18-36 years with 24.8% whereas warm vertical condensation was higher among 36-45 years. This was found to be statistically significant ($p=0.01$)

Conclusion:

During endodontic treatment, it is impervious for an operator to avoid iatrogenic accidents therefore, great caution should be taken during the root canal treatment and always be exercised to avoid the undue enlargement of root canals. From this study we can conclude that the correlation between taper size and types of sealer used for obturation was 6% and the most commonly used sealer was resin based sealer and zinc oxide based sealer

KEYWORDS:

Sealer extrusion, master cone, obturation, root canal treatment, taper, Dental innovation.

INTRODUCTION:

Endodontic therapy is performed to clean the root canal system, alleviate pain and eliminate infection from the tooth. Root canal obturation serves the main purpose of impeding the traffic of fluids from the periradicular tissues or saliva into the canal as well as bacteria and their virulence factors and antigens from the canal to the periradicular tissues[1,2]. Ideally, the filling material should reach to the apex of the root, without extending into periapical tissues or other neighboring structures. However, sometimes, over-instrumentation of a root canal with manual or rotary instruments, allows the extrusion of sealers, dressing agents, irrigation solutions and microorganisms out of the tooth, into the surrounding anatomical structures and periapical tissues [3]. Although small material extrusions are generally well tolerated by the periradicular tissues, clinical symptoms such as pain, swelling of the lip, dysesthesia, paraesthesia, hypoesthesia and anesthesia may appear, especially when the extruded filling materials are either close to, or in intimate contact with nerve structures[4]. There are generally considered to be four possible types of factors that can cause tissue damage and lead to the following symptoms such as chemical factors because of the neurotoxic effects of the products used to clean or fill root canals, mechanical trauma from over-instrumentation (ex. perforation of mandibular canal), a pressure phenomenon from the presence of core filling material or sealer within the inferior alveolar canal, and overheating of tissues because of incorrect warm condensation techniques. All these can initiate an inflammatory process which may lead to treatment failure[5]. Generally, the normal therapeutic sequence for the complications mentioned above, is firstly to control pain and inflammation, and then, whenever possible, the surgical elimination of the cause[6].

Ideally, the filling material should be restricted to the intraradicular space [4]. Studies have shown that the highest success rate of endodontic treatment is observed for teeth with root canal fillings ending 0–2 mm short of the radiographic apex, and cases with underfillings or over fillings display significantly lower rates [7].

However, there are circumstances in which it is not possible to control application of the material, and some apical extrusion occurs. In addition, the use of some thermoplasticized gutta-percha filling techniques is also associated with a higher incidence of filling material extrusion[8]. When extruded, the fate of the filling material will depend on its solubility in the tissue fluids and susceptibility to phagocytosis, whereas its influence on treatment outcome arguably depends on the material's biocompatibility. It has been suggested that the lower healing rate associated with over fillings is a result of the cytotoxicity of the root filling material [9] or a foreign body reaction to some of its constituents. However, evidence indicates that the apical extent of root canal fillings seems to have no direct correlation to treatment failure provided infection is absent [10,11]. Overfilling may impair the prognosis of treatment of infected teeth with apical periodontitis, and this is possibly related to a deficient apical seal and/or previous overinstrumentation causing extrusion of infected debris[12]. It has also been suggested that the extraradicular occurrence of a filling material may slow down the healing process of apical periodontitis.

Our team has extensive knowledge and research experience that has translate into high quality

publications[13–22],[23–26],[27–31],[32]
[13–22]

Hence, the aim of the present study is to correlate the taper and preparation size with radiographic sealer extrusion in lower mandibular molars.

MATERIALS AND METHOD:

The study was designed as a retrospective cross clinical study analysing all the patients who had lower first molar root canal treatment with sealer extrusion. The data of 86000 patient records were reviewed and analysed between June 2020 and March 2021 from which 50 patients with sealer extrusion were identified. The records with Incomplete medical documentation, replication of results, improper clinical photographs or diagnosis were excluded from the study.

Inclusion criteria:

- Patients who underwent root canal treatment in mandibular first molars(36,46)
- 16 to 65 year age grouped patients
- Root canal treated teeth with sealer extrusion

Exclusion criteria:

- Patients below the age of 16 years
- Retreatment cases

Data collection: Patient details like age, gender, teeth number, obturation techniques, taper size, master cone size and types of sealers used were recorded. The collected Data was described as frequency distribution and percentile. Statistical analysis was performed using Statistical Package for the Social Sciences ,version 22(SPSS).**Independent variables** were PID, Name; **Dependent variables** were age, gender, tooth number, taper preparation and size. Descriptive analysis was based on quantitative variables and frequencies for categorical variables. A Chi square test was applied to determine the significance between groups. p value < 0.05 was considered to be statistically significant with a confidence interval of 95%.

RESULTS:

A total of 50 patients of the 16 to 65 year age group were examined to find out the Correlation of taper and preparation sizes to radiographic sealer extrusion in mandibular first molars. Among 50 study subjects, 52% were males and 48% were females as illustrated in figure 1. Figure 2 depicts the frequency distribution of the most commonly affected age group by root canal treatment sealer extrusion belonging to 18 to 36 years of age. Figure 3 infers that the most commonly used obturation technique was matched taper single cone techniques with 50%. Both right and left lower molar had equal prevalence of root canal sealer extrusion (50% respectively). There were higher patients with lower molar sealer extrusion among obturation done with resin based sealer with 64 % (figure 4). The most commonly used master cone size was 25 (50%) and 30(50%). There were higher patients with lower molar sealer extrusion among obturation done with 6% taper with 66 % (figure 5). Matched taper single cone technique was the most common type of obturation technique among 18-36 years with 24.8% whereas warm vertical

condensation was higher among 36-45 years. This was found to be statistically significant ($p=0.01$) (Figure 6). Figure 7 depicts the correlation between taper size and types of sealer used for obturation, in which 6% taper was the most common size among resin based sealer with 44.9% and zinc oxide based sealer with 20.41%. This was found to be statistically significant ($p=0.001$).

DISCUSSION:

Clinically, voids in root fillings are difficult to detect because conventional x-rays give a limited two-dimensional view of the tooth[33]. Root canal obturation from a conventional radiograph is regarded as acceptable when the density is uniform along the canal from the orifice level to the terminus and compatible with the canal walls[34]. Among a total of 50 patients, the most commonly affected age group was 54% belonging to 18 to 36 years of age. This study results are in concordance with the study done by Hassan et al[35], in which patients aged 21 to 25 years reported with sealer extrusion was 63.2%.

A study comparing three different tapered preparations (4%, 6% and 8%) on the quality of obturation found that the larger the taper the better the obturation. There was no significant difference between 6% taper and 8% taper but both were significantly better than the 4% taper,[36,37]implying improvements in obturation with increasing taper. However the current study shows sealer extrusion was reported more with 6% taper size with 66% root canal treated teeth.

With respect to the extrusion of GP beyond the apical foramen, this is a common finding in endodontics[38]. The incidence of extrusion of matched taper single cone technique has been shown to be 50% compared with 20% for cold lateral obturation,[39] and matched taper single cone technique had more extruded GP than other obturation techniques[40,41], which is in concordance with our study, where matched taper single cone obturation technique had more sealer extrusion (50%) than other technique. Although calcium hydroxides and zinc oxide based sealers are shown to have a better quality of obturation than resin based sealer which is in concordance with the study done by et al ,[42,43]which is responsible for more sealer extrusion.

Although irrigation plays an integral role in reaching inaccessible areas for instrumentation, disintegrating soft tissue, removing the smear layer and disinfecting the canal,[44,45] it has been shown that the root canal system should be prepared up to size 30 at least for irrigation to reach the apical third. whereas, our study results shows that the most commonly used prepared sizes were 25 and 30. However, enlargement of the root canal system during shaping procedures can increase the risk of root fracture. For example, root fracture is a common finding in maxillary premolars because of the small mesiodistal dimension of their roots[46]. Furthermore, cracks in radicular dentine have been found to be associated with endodontic retreatment irrespective of whether rotary or hand file instruments were used[47,48].

The limitation of the study is that it was a single centered study with small sample size and doesn't represent ethnic groups. The future scope of the study focuses on a study for a large population. Preventive measures need to be taken in future to decrease sealer extrusion in root canal treatment.

CONCLUSION:

From this study we can conclude that the correlation between taper size and types of sealer used for obturation was 6% and the most commonly used sealer was resin based sealer and zinc oxide based sealer. The root canal system should be prepared upto size 30 with proper irrigation without any iatrogenic trauma to the teeth. During endodontic treatment, it is impervious for an operator to avoid iatrogenic accidents therefore, great caution should be taken during the root canal treatment and always be exercised to avoid the undue enlargement of root canals.

ACKNOWLEDGEMENT

The authors sincerely acknowledge the faculty Medical record department and Information technology department of SIMATS for their tireless help in sorting out data pertinent to this study.

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 MA Enterprises pvt Ltd.

CONFLICT OF INTEREST: None

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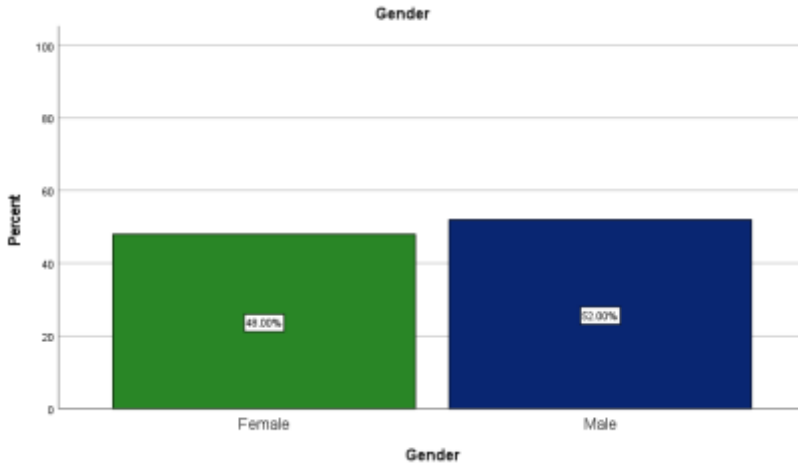


Figure 1: Shows the distribution of the population based on gender . The X axis depicts the gender -Male and Female and Y axis is the percentage of patients with sealer extrusion. Male patients were predominant with 52%

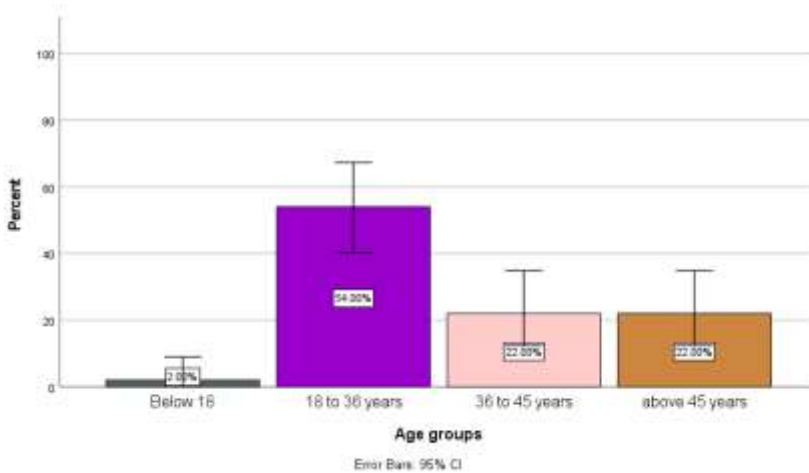


Figure 2: Shows the distribution of the population based on age . The X axis depicts the age group-below 18 years, 18 to 36 years, 36 to 45 years and above 45 years and Y axis is the percentage of patients with sealer extrusion. There were higher patients with lower molar sealer extrusion among the 18 to 36 years age group with 54%.

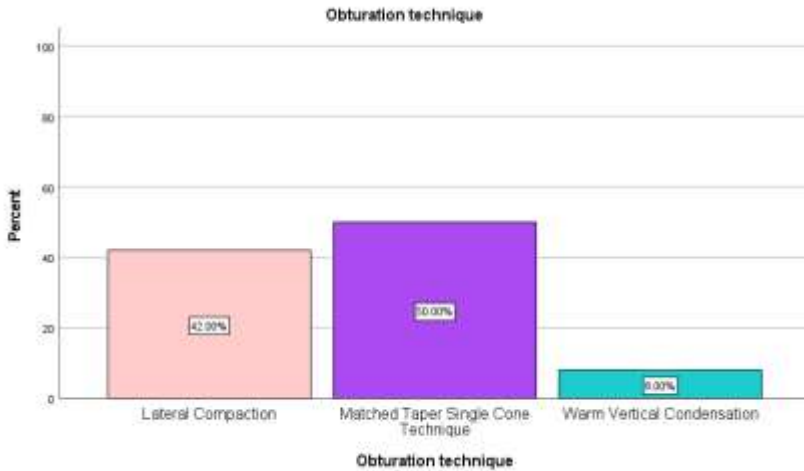


Figure 3: Shows the distribution of obturation technique. The X axis depicts the obturation technique and the Y axis represents the patients with sealer extrusion. There were higher patients with lower molar sealer extrusion among matched taper single cone techniques with 50%.

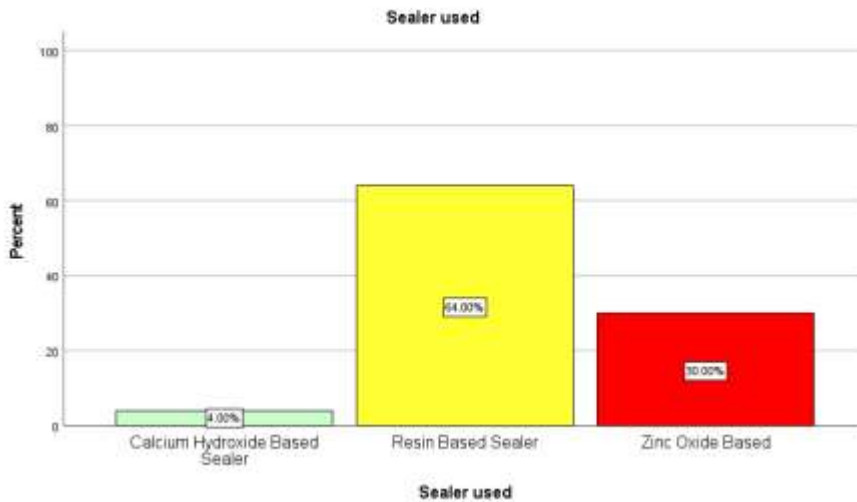


Figure 4: Shows the distribution of types of sealer used. The X axis depicts the types of sealer used and y axis represents the patients with sealer extrusion. There were higher patients with lower molar sealer extrusion among obturation done with resin based sealer with 64 %.

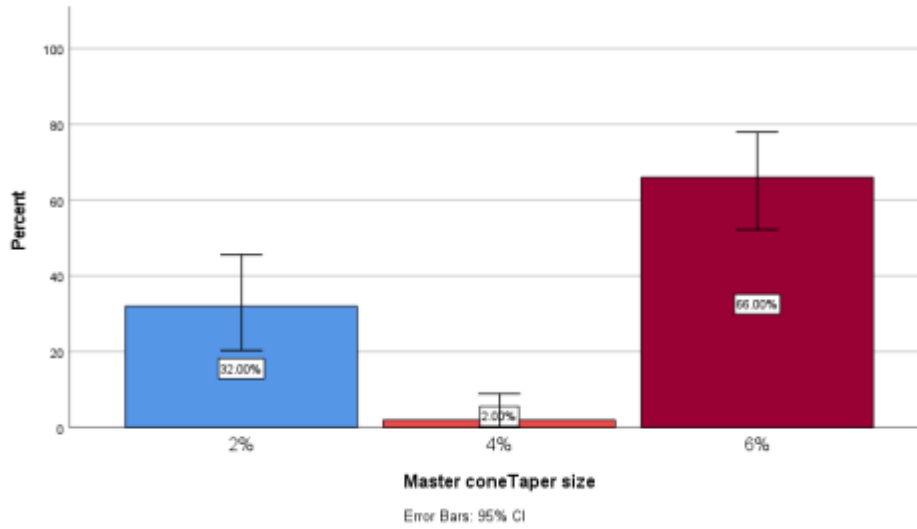


Figure 5: Shows the distribution of master cone taper size used. The X axis depicts the master cone taper size and the Y axis represents the patients with sealer extrusion. There were higher patients with lower molar sealer extrusion among obturation done with 6% taper with 66 %.

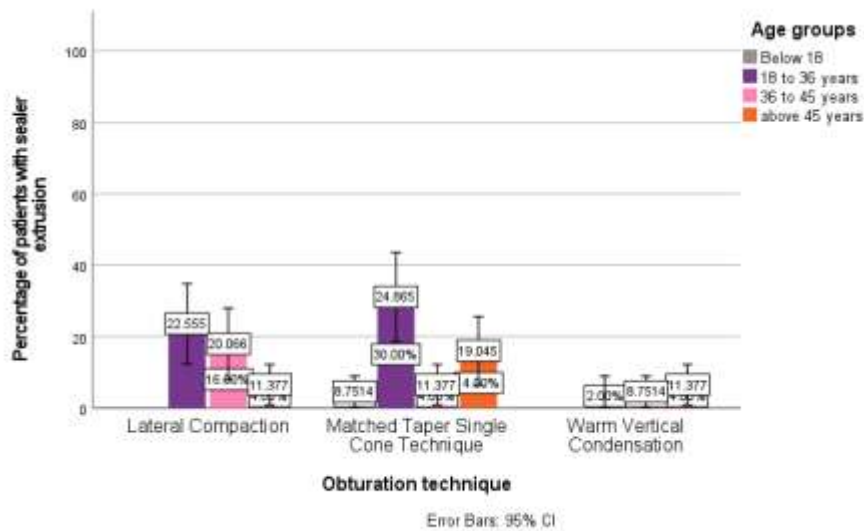


Figure 6 : Bar graph showing the association between age and obturation technique. X axis represents the obturation technique and the Y axis the percentage of patients with sealer extrusion . Purple represents 18-36 years, purple is 36 to 45 years and orange is > 45 years. Matched taper single cone technique was the most common type of obturation technique among 18-36 years with 24.8% whereas warm vertical condensation was higher among 36-45 years. This was found to be statistically significant. Pearson Chi square, $p= 0.01$ ($P < 0.05$, statistically significant).

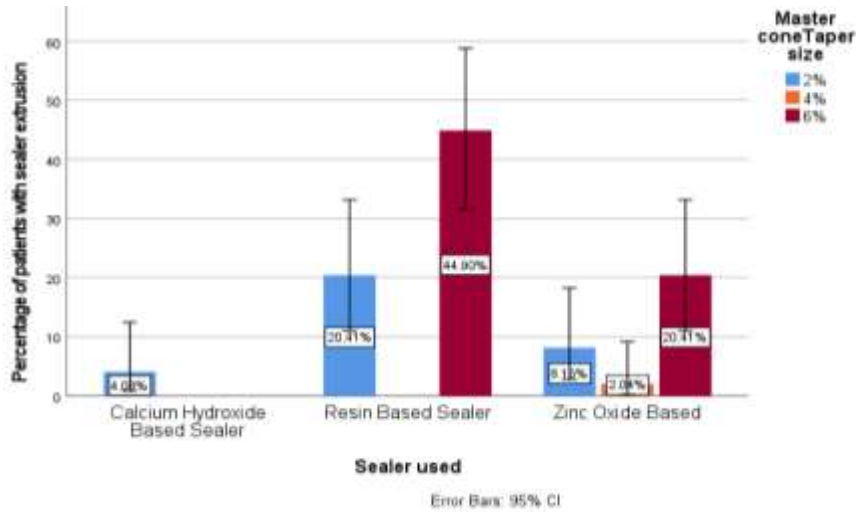


Figure 7: Bar graph showing the association between master cone taper size and types of sealer. X axis represents the sealer used and the Y axis the percentage of patients with sealer extrusion . Light blue represents 2% , orange is 4% and brown is 6%. 6% taper was the most common among resin based sealer with 44.9% and zinc oxide based sealer was 20.41% whereas 2% was higher among calcium hydroxide based sealer with 4.08%. This was found to be statistically significant. Pearson Chi square, $p = 0.001$ ($P < 0.05$, statistically significant).