Type of Study: ***Retrospective study***

A Comparative Retrospective Analysis on Choice of Taper and Preparation Sizes among the Postgraduate Students in Mandibular Molars with and without Periapical Pathosis

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Abstract

Preparation of the root canal system is recognised as being one of the most important stages in root canal treatment. Cleaning and shaping is the crucial phase that eliminates infection. It involves removal of vital and necrotic tissues from the root canal system along with root dentin. The aim of the present study is retrospective analysis on choice of taper and proportion sizes among the postgraduate students in mandibular molar with and without periapical pathosis. It is a single centred retrospective study, data was collected after reviewing 86000 records of the patients between June 2019 and March 2020.Tapers used in the preparation of the root canal system for mandibular molars have been assessed. In this study we observed that significant association between taper of preparation and periapical pathosis ($p<0.05$). Within the limitations of the study, 6% taper has been used for the teeth with periapical pathosis. 4% and 6% taper has been used in teeth without periapical pathosis.

Keywords : *Endodontic Therapy, Mandibular Molars, Periapical pathosis, Root canal treatment, Tapers.*

Introduction

Preparation of the root canal system is recognised as being one of the most important stages in root canal treatment.[1–3] It includes the removal of vital and necrotic tissues from the root canal system, along with infected root dentin and , in cases of retreatment, the removal of metallic and nonmetallic obstacles. It aims to prepare the canal space to facilitate disinfection with the help of irrigants and medicaments.[4,5] Thus, canal preparation is the essential phase that eliminates. Prevention of reinfection is then achieved through the provision of a fluid tight root canal filling and a coronal restoration. Although mechanical preparation and chemical disinfection cannot be considered separately and are commonly referred to as chemomechanical preparation or biomechanical preparation.[6–8]

However, studies have observed that the current instrumentation and irrigation techniques are not completely effective in the elimination of debris and bacteria from the apical third.[9,10] The difficulty in the removal of bacterial debris from the apical third has been attributed to the narrow canal space, the complex canal morphology, inadequate flushing of irrigants and variations in diameter of the root canal.[11–13] The enlargement of the apical area has been advocated to ensure an adequate depth of penetration of the irrigant for better cleansing.[1,4,14] However, the extent of apical enlargement required is a matter of debate. Preparation to larger apical sizes has been suggested by its protagonists to be the most efficacious way of cleaning and disinfecting the canals. Larger apical preparations allow better removal of infected dentin[15–18], enhance the flushing action of irrigants in the apical region and significantly reduce the bacterial load in the root canal

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system.[19–24]

The drawbacks of larger apical preparations include undesirable deviation from the original shape of the canal, weakening of the root and procedural complications like ledge formation, transportation and perforation.[25–27] The aim of the present study is to retrospectively analyse on the choice of taper and proportion size among the postgraduates students in mandibular molars with and without periapical pathosis.

Materials and Methods

The following single centred retrospective study was performed, data was collected from reviewing patients records and analysed the data of 86000 patients between June 2019 and March 2020. After reviewing all the records,1326 patients records were selected who underwent root canal treatment in mandibular molars. All the records were cross checked with the help of the radiographs by other reviewers to eliminate the sampling bias. Individuals excluded from this study were, fractured instruments, 2% taper, anteriors, premolars, upper molars. Inclusion criteria was 4% taper, 6% taper, lower molars, multi visit RCT, single visit RCT.

Considering single centred retrospective study, multiple operators are involved in treatments to reduce selection bias. The parameters assessed in the study are age group, gender, taper, multi visit and single visit. The collected data was entered in the excel sheet. After grouping, the parameters data was copied into the SPSS software and statistical analysis was done.

Statistical Analysis

Statistical analysis was done using SPSS (SPSS inc., version 23, chicago,IL, USA Norman H. Nie, Dale H. Bent, C. Hadlai Hull). To describe the significance between two groups, Chi square test was used where p-value < 0.05 was considered statistically significant.

Results and Discussion

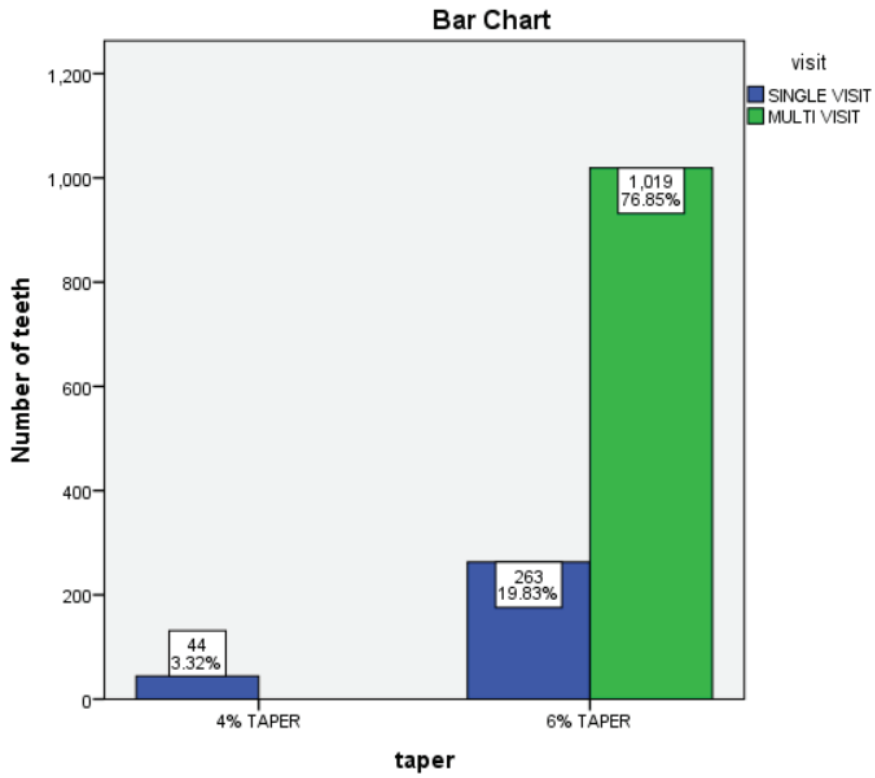
Frequency tables were used to describe the variables included in the study. Data on age included for the present study is represented in (Table 1), among the included age groups most of them were old aged (51-60) ranging around 44.7%. The association between 4% taper and 6% taper with single visit, multi visit is shown in (Table 2 and chart 1). The relation between tooth and taper is shown in (Table 3 and chart 2) where the mandibular 2nd molar was prepared only with 6% and the 1st molar was prepared with 6% and 4%, but the maximum was with 6% taper. In this study, we contemplate that there is significant association between taper of preparation and periapical pathosis (p value <0.05).

Table 1 : Frequency of age distribution of patients undergoing root canal treatment, which shows that 51-60 years have undergone more number of root canal treatments(44.7%) followed by 41-50 years (23.7%).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-30	192	14.5	14.5	14.5
	31-40	227	17.1	17.1	31.6
	41-50	314	23.7	23.7	55.3
	51-60	593	44.7	44.7	100.0
	Total	1326	100.0	100.0	

Taper	Visit		Chi square value	P value
	Single visit	Multi visit		
4% Taper	44	1019	151.058	.000
6% Taper	NIL	263		

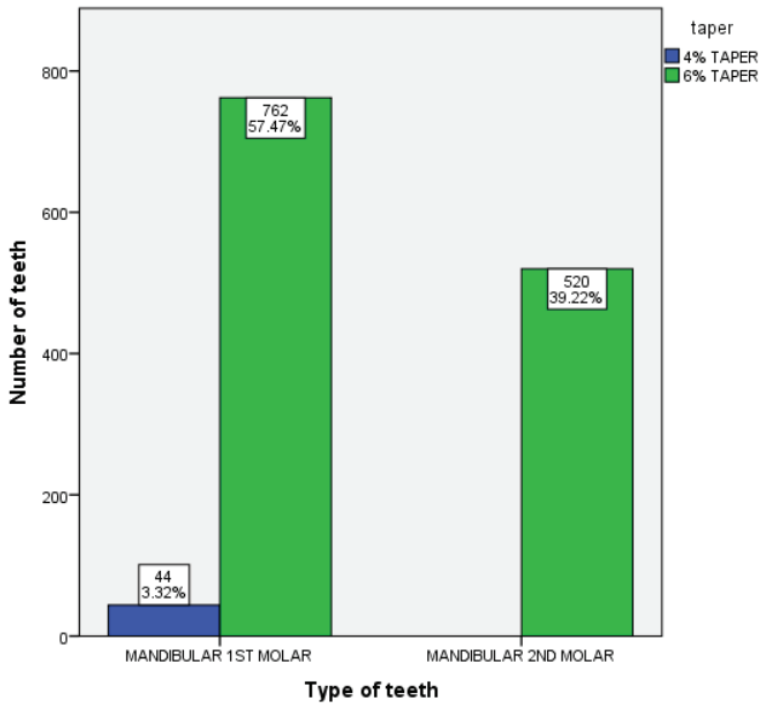
Table 2: This table represents association between 4% taper and 6% taper and vist where single visit is teeth without periapical pathosis and multi visit is teeth without periapical pathosis. However Chi square test, p = 0.000, significant difference seen (p<0.005)



Bar chart 1 - This bar chart represents the association between taper used in multi visit(teeth with periapical pathosis) and single visit (teeth without periapical pathosis) , X axis represents the taper used and Y axis represents the number of teeth ; blue color depicts single visit (without periapical pathosis) and green color depicts multi visit (with periapical pathosis). The chart shows 4% taper was used in single visit that is teeth without periapical pathosis (3.32%); 6% taper was used in multi visit that is teeth without periapical pathosis (76.85%) and in single visit (19.83%). However Chi square test, p = 0.000, significant difference seen (p<0.05)

Taper	Teeth		Chi square value	P value
	Mandibular 1st molar	Mandibular 2nd molar		
4% Taper	44	NIL	29.361	.000
6% Taper	762	520		

Table 3 : This table represents association between mandibular 1st molar, mandibular 2nd molar with 4% taper and 6% taper. However Chi square test, p=0.000, significant difference seen(p<0.05)



Bar chart 2 - This bar chart represents the association between teeth and taper, X axis represents type of teeth that are mandibular 1st molar, mandibular 2nd molar and Y axis represents the number of teeth; blue color depicts 4% taper and green color depicts 6% taper. The chart shows in mandibular 1st molar 57.47% used 6% taper , 3.32% used 4% taper and in mandibular 2nd molar 39.22% used 6% taper.However Chi square test, p=0.000, significant difference seen(p<0.05)

The present study was mainly targeted in evaluating the choice of taper preferred by endodontic postgraduates for the endodontic therapy in mandibular first and second molars. The reason for choosing only the mandibular molar is because the chances of possible iatrogenic events are more [28],the procedure and protocol for treating mandibular molars is complex as compared to maxillary molars. In regards to the endodontic literature the shape and apical preparation sizes chosen for a case based scenario is different. According to the present literature evidence, increased tapers and preparation sizes have proven to induce more healing than compared to the counterpart [29] the reality is shape should be optimal to clean more, given that no optimal large size has ever been defined.[30] But, the present trend with introduction of sophisticated technology, the enhanced healing rates were observed in cases with minimally compromised dentin.

The results of the present showed that overall choice of taper in both the visits was 6%. However,Endodontists also choose 4% taper in single visit cases mainly aimed to conserve the root dentin and none of the operators choose 4% taper for multi visit cases. So, statistically results showed the favourance of operators to 6% taper ($p < 0.05$) as compared to 4% tapered preparations in both the protocols. So, our study was primarily aimed at evaluating the choice of taper for single or multi visit and to assess any choice of taper and its significance in periapical pathosis. The choice of taper in a clinical scenario is multifactorial and declared to be choice based rather than evidence based. One cannot solely rely completely on taper for enhanced healing. Many in vitro literature has shown that an increase in taper often leads to increased failure of endodontically restored teeth[29,31]. Ideally a single visit root canal treatment should concentrate on the pulpal debridement and multi visit protocol has to concentrate on the removal of maximal amount of infected dentin with aiming in bacterial biofilm reduction. Literature has shown its favourance towards the increased tapers as compared to reduced tapers[31]. So, the views of the operators of the present study were in concordance with the available literature evidence.

Primarily when evaluated, there is still an ambiguity in preferable taper and apical preparation size advisable for specific cases although one cannot generalise a standardised common taper and preparation size for all cases. Especially, a clinical decision on specified taper and preparation sizes for a specific tooth undergoing endodontic therapy varies from a clinical condition, canal curvature and intricate root canal anatomy and ultimately based on the operators decision. But, compared to the operators choice and experience the decision should be taken based on the literature evidence it is stated that, increased apical preparation sizes showed improved healing outcomes on clinical radiographic evaluation.[31–35]

Within the limited information currently available, the 6% taper was used in all the cases with periapical pathosis. It is unknown if in root canal systems with previous vital pulps versus necrotic pulps with no noticeable periapical pathosis. The enlargement of the apical size would result in better healing outcome. However, vital pulps or necrotic pulps with absence of periapical pathosis have better prognosis.[12,36–38] Data from systematic reviews state that

Our results contrary to the findings of previous studies that evaluated the effect of the apical size of canal preparation on treatment outcome to date.[39–41] Hence the use of common taper in all teeth cannot be justified with a small sample. Present study was limited in evaluating the choice of taper among the cluster of endodontists in a university set-up. Although preliminary data was obtained on the choice of taper in different visits, Future studies should better analyse the effect of taper used on the healing outcome with longer follow ups.

Limitations

The limitations of this study was, it has small sample size, cannot be generalized to all teeth using this data. The period of evaluation was also very less.

Conclusion

Within the limitations of the study 6% taper has been used for the teeth with periapical pathosis 4% and 6% taper has been used in teeth without periapical pathosis. 6% taper was the preferred choice among endodontists, reason for choosing this taper was improve the flow of irrigant especially at the apical third.

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Conflict of Interest: Nil

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

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