ORIGINAL ARTICLE

DIFFERENCE IN OBTURATION QUALITY IN POSTERIOR TEETH AFTER MANUAL AND ROTARY CANAL PREPARATION TECHNIQUES

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ABSTRACT

The aim of this study was to assess the radiographic quality of root canal obturation provided by the postgraduate students in posterior teeth using nickel-titanium (NiTi) rotary files in a crown-down approach compared with stainless steel standard preparation technique.

It was cross sectional analytical study and data was retrospectively retrieved by periapical radiographs of root canal treated posterior teeth from archival records of Armed Forces Institute of Dentistry. Teeth with excessive root curvature were not included in the study. A total of n=80 post obturation radiographs were retrieved. Forty radiographs of posterior teeth prepared with rotary preparation technique and 40 radiographs of posterior teeth prepared with manual preparation technique. These radiographs were assessed to evaluate technical quality of obturation in terms of length, density and taper of root filling. Chi- square test was applied to compare the difference in technical quality of obturation between two canal preparation techniques.

Amongst 40 molars prepared with rotary instruments, 36 had acceptable length, 34 had adequate density and 37 had adequate taper. Amongst 40 molars prepared manually, 24 had acceptable length, 15 had adequate density and 22 had adequate taper.

Radiographic technical quality of the obturation (length, density and taper) was better with rotary technique as compared to manual canal preparation technique.

Key Words: *Root canal treatment, radiograph, rotary and manual canal preparation techniques.*

INTRODUCTION

Endodontic therapy is necessary to conserve a tooth whose pulp has been damaged irreversibly. Successful root canal treatment retains the tooth as a functional unit in the oral cavity.[1] Root canal treatment is considered successful if clinical sign and symptoms are relieved and also there is radiographic evidence of periapical healing.[2] Literature has shown that technical quality of obturation plays an important role in the prognosis of a root canal treatment.[3] Thus technical quality of root canal filling can be used as a means to evaluate the prognosis of root canal treatment. Multiple criteria have been used for the evaluation of technical quality of root filling. These criteria are based either on clinical evaluation of sign and symptoms or the radiographic evaluation of the treated teeth. Evaluation of post obturation radiographs is one of the methods to evaluate the technical quality obturation.[4-7]

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.[8] These characteristics of root canal filling should be evaluated on radiographs to judge the technical quality. American association of Endodontists drafted in 2009 that "For radiographic evaluation of root canal fillings, the three qualities that should be observed are: length, shape and density. The length of an ideal fill should be from the canal's apical minorconstriction to the canal orifice unless a post is planned. The shape of the completed case is somewhat dependent on the instrumentation technique being used. Voids should not be visible on the radiographic image".[9]

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The introduction of nickel-titanium (NiTi) rotary files to Endodontics almost two decades ago has changed the way root canal preparations are performed; enabling more complicated root canal systems to be shaped with fewer procedural errors.[10]

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.[1,4,5,7,8] The aim of the present study was to evaluate the obturation quality between manual and rotary instrumentation technique in clinical practice.

METHODOLOGY

It was cross sectional analytical study and the data used in the current study consisted of a sample of periapical radiographs of patients who received root canal treatment at the Armed Forces Institute of Dentistry as a routine investigation and were not specifically taken for the study. An effort was made to exclude most of the radiographs with superimposed canal fillings or over-projection of anatomical structures, to eliminate the possibility of radiographic misinterpretation. All permanent maxillary and mandibular molars in which root canal treatment were indicated either clinically or recommended due to elective endodontics were included in the study. All molars with severely curved roots, having sclerosed canals, tooth require endodontic retreatment or tooth with apical root resorption were excluded from study.

In group A n=40 radiographs of posterior teeth prepared with rotary technique and in Group B, 40 radiographs of posterior teeth prepared manually with hand instruments were included in present study. Total sample size was n-80.

All molars of Group-B were obturated by cold lateral condensation guttapercha technique using calcium hydroxide based sealer, while all molars of Group-A were obturated with guttapercha points of protaper system (greater taper) using calcium hydroxide based sealer. Postoperative periapical radiographs of root canal treated molars were obtained immediately after the obturation using paralleling device.

The radiographs were evaluated independently by two senior clinicians. Films were examined using handheld X-ray film viewer with magnifying lens that could be moved in different angulations for varying magnification. The results were compared, and a final evaluation was agreed. In case of disagreement, the two examiners discussed the case to reach a consensus. The technical quality of the root fillings (i.e. length, density and taper) was evaluated as per the criteria given in Table 1.

For statistical analysis, the tooth was considered as a unit. The analysis of the data was performed using SPSS 16.0 for Windows. Pearson chi-square test was applied to compare technical quality of obturation of rotary and manually prepared root canals.

TABLE 1: CRITERIA USED TO ASSESS RADIOGRAPHIC OF ROOT FILLING

Parameter	Criteria	Define quality of root filling
Length of root filling	Adequate	Root filling ending ≤ 2 mm from radiographic apex
	Overfilling	Root filling beyond the radiographic apex
	Short filling	Root filling >2 mm from radiographic apex
Density of root filling	Adequate	No voids present in the root filling or between root filling and root canal walls
	Inadequate	Voids present in the root filling or between root filling and root canal walls
Taper of root filling	Adequate	Consistent taper from the orifice to the apex
		No consistent taper from the orifice to the apex

TABLE 2: THE LENGTH, DENSITY AND TAPER IN RELATION TO CANAL PREPARATION TECHNIQUE

Obturation quality		Manual prep (%)	Rotary prep(%)	Total (%)
Density of root filling	Inadequate	25 (62.5%)	6(15%)	31(38.7%)
	Adequate	15 (37.5%)	34(85%)	49(61.2%)
Taper of root filling	Adequate	22 (55%)	37(92.5%)	59(73.7%)
	Inadequate	18 (45%)	3(7.5%)	21(26.2%)

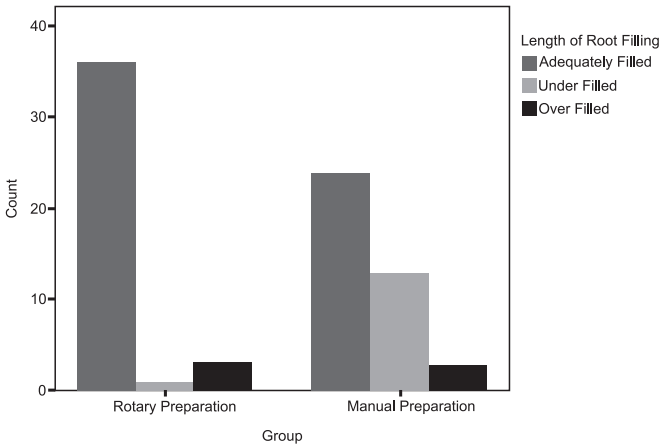

Fig 1: Difference in length of root filling in both groups

RESULTS

Amongst 40 molars prepared with rotary instruments (Group A: Protaper system, Dentsply Maillefer), 36 (90%) had obturation up to acceptable length, 34 (85%) had adequate density and 37 (92.5%) had adequate taper. Whereas amongst 40 molars prepared manually 24 (60%) had obturation of acceptable length, 15 (37.5%) had adequate density 22(55%) had adequate taper as depicted in Fig 1 and Table 2. Differences in length (p=.002), taper (p=.000) and density (p=.000) of Group A and Group B obturations were found to be statistically significant.

DISCUSSION

In this study two different canal preparation techniques (manual and rotary) were compared on the basis of technical quality of root canal filling. Technical quality of root canal filling was evaluated on the basis of three characteristics including length, density and taper of root canal filling.

Adequate length of root canal filling was found in 90% cases in teeth prepared with rotary technique and in 60% cases in teeth with manual root canal preparation in this study. These findings are similar to the results of study conducted by Robia in 2011 in which he found adequate length of root filling in 90% cases with rotary preparation and 75% cases with manual preparation.[11] Also the results of this study are consistent with the results of other studies which showed 73%, 61% and 62% adequate length of root filling conducted by MoradiandGharechahi, Barrieshi-Nusair and Chueh et al. respectively.[8,12,13]

In the present study adequate density of root canal filling was found in 85% and 37.5% cases prepared with rotary and manual canal preparation technique respectively. These findings are also consistent with the results of study conducted by Robia in 2011 in which adequate density was found in 83% and 47% cases with rotary and manual preparation respectively.[11] For manual preparation technique findings of this study were also consistent with the study of Balto et al. (35%).[14]

In the present study adequate taper of root canal was found in 92.5% and 55% cases prepared with rotary and manual root canal preparation techniques respectively. For rotary these are consistent with the study of Robia which showed 90% adequate taper but as far manual preparation is concerned results of this study were a little superior to the results of the study conducted by Robia in which adequate taper was found in 40% cases prepared with manual hand instrument technique.[11] Average results were also consistent with the results of study conducted by Er et al.[15] Results of this study indicated that rotary preparation of root canals is superior to manual hand instrument preparation technique and this is consistent with the results of studies conducted by Robia in 2011 and Kleier DJ et al.[16]

CONCLUSION

Overall quality of obturation was found to be better with rotary canal preparation technique as compared to manual canal preparation technique.

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