ORIGINAL ARTICLE

COMPARISON OF QUALITY OF ROOT CANAL OBTURATION IN SINGLE ROOTED TEETH PREPARED BY MANUAL AND ROTARY METHOD

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ABSTRACT

Root canal preparation not only removes degenerated pulp but also gives the canal a proper shape. Recent advances in instrumentation have led to the need to evaluate the outcome of different types of endodontic instrumentation on the quality of root canal treatment.

The objective of this study was to compare the quality of root canal obturation by intraoral periapical radiographs in single rooted teeth prepared by manual technique versus rotary method.

This study was a randomized control trial conducted at Rawal Institute of Health Sciences for a period of 3 months (from 1st Dec, 2017 to 1st March, 2018). A total of 60 single rooted teeth (incisors, canines, premolars) were randomly divided into two groups (n=30). For Group 1, instrumentation was done using rotary system and for Group 2, manual technique was used. Post obturation radiographs were compared using T-score in terms of difference in length, density and taper of root canal filling. Statistical results were obtained using SPSS version 17.0. Chi-square test was applied to assess the difference between the length, homogeneity and taper of the root canal filling between the two groups. Our study found significant difference in obturation quality between the two interventions (p-value, 0.025). In rotary group, 86.7% patients achieved T-score of 2 and 3 compared to 53.3% in the manual group. Taper and the overall obturation quality done by rotary method was better as compared to conventional technique. However, radiographic technical quality of the root canal obturation in terms of length and density was almost same in rotary and manual instrumentation technique.

Key Words: *Root Canal Treatment; rotary method; manual technique; obturation quality*

INTRODUCTION

Endodontic instrumentation and root canal obturation are important and necessary steps of root canal treatment with a purpose of removing infected tissue from the canal and to seal the canal from future bacterial contamination.[1]

Proper shaping of the canal is one of the factors which can predict the outcome/success of the root canal treatment.[2] Instruments/endodontic files should be in intimate contact with the walls so that debridement can occur in a proper way.[3]

Many techniques are mentioned in literature for the preparation of root canal using the manual stainless steel files.[4] Probable procedural errors associated with manual stainless steel files especially in curved canals include ledge, elbow and zip formation, perforation and instrument separation which can be a risk factor for endodontic failure later on.[5,6] There is increased difficulty in canal preparation when more narrow or ribbon shaped canals are present. Especially the apical third of the root might not be cleaned properly if instrumentation and irrigation does not reach till end.[5,7]

Recent advances in the field of endodontics have led to the use of rotary instruments in dental practice. The use of Niti rotary files has given ways to modern methods which could eliminate some of the short comings of traditional endodontic instrumentation at the same time reducing the time and number of instruments required for canal preparation.[8,9]

Successful outcome of the endodontic treatment depends upon several factors broadly divided into dentist related factors (experience, skills), tooth related factors(position of tooth in the arch, canal anatomy, number of canals), instrumentation technique used, proper irrigating solution, type of obturation, condi-

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tions during treatment(rubber dam, good illumination and magnification),economical factors (pay scale, time availability).[3,7,8] Quality of obturation is one of the characteristic determinant in the prognosis of root canal treatment. One of the ways to judge the quality of endodontic treatment is by radiographic evaluation which is the most common method used for assessment so far. Radiographic quality of the endodontic treatment can be evaluated on the basis of three parameters which include length, homogeneity and taper of the root canal filling visible on radiographs.[7,9]

Although several researches have been conducted among the undergraduates, graduates and postgraduates for the evaluation of the obturation quality using different methods of canal preparation (manual/rotary), but the results are quite variable.[10,11,12] These highly variable results have made it difficult for the dentists to opt for manual or rotary instrumentation for better outcome of the treatment.

Therefore this study was conducted with the purpose to evaluate whether canal instrumentation technique (manual/rotary) effects the quality of obturation or not and to assess the difference between the obturation quality using both techniques individually on selected group of patients.

MATERIALS AND METHODS

A randomized control trial was held at the Department of Operative Dentistry in Rawal Institute of Health Sciences for 3 months duration from December 2017 to March 2018. Sample size was strategized from a previous study which came out to be 60 [(1)] (i.e. 30 in each group). Patients requiring Root Canal Treatment for anterior teeth (single rooted only) were included in the study. All the multi-rooted teeth and teeth with apical pathology and blocked canals were excluded from the study. Before starting the treatment, patients were informed about the procedure and informed consent was taken. Patients requiring endodontic treatment of single rooted teeth were selected from the OPD and randomly divided into 2 groups using computer generated randomization scheme. For Group 1, canal preparation was done using Rotary System (Protaper Niti) followed by obturation with Protaper Gutta Percha and for Group 2, instrumentation was done using conventional method (using K and H files manually) followed by cold lateral condensation technique of obturation using Gutta Percha. Same sealer (endomethasone) was used for obturation in both groups. Soon after the completion of the endodontic treatment, intraoral periapical radiograph was taken using bisecting angle technique.

Evaluation of the post operative intraoral periapical radiograph was done on the basis of three parameters by another dentist in the department who was not aware of the type of instrumentation method used (rotary/manual). Each of the parameter was then precisely assessed individually; i) length of the root canal filling, ii) homogeneity of the root canal filling and iii) taper of the root canal filling.

Scoring system (T-score) was established based on the adequacy/inadequacy of these parameters. T-score was obtained by adding the individual points for each parameter (adequate =1, inadequate =0) If all three of these parameters were found to be adequate, obturation was considered as 'ideal' and T-score was marked as 3. If two of the parameters were found to be adequate, T-score was marked as 2. If only one of the parameters was adequate, T-score was marked as 1 and if none of the parameter was found to be adequate, obturation was considered as 'poor' and T-score was marked as 0. The primary outcome was based on comparison of T-score between the two groups.[(12)]

Results were analyzed using SPSS software version 17.0 (SPSS Inc., Chicago, IL, USA). Chi-square test was applied to compare the obturation quality between two groups. A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 60 single rooted teeth (34 females, 26 males) were included in this study. There were 20 (66.6%) males and 10 (33.3 %) females in Group 1(rotary) where as 24 (80 %) females and 6 (20 %) males in Group 2 (manual). Average age of patients was 33.3 ± 7.4 years in Group 1 and 37.6 ± 12.9 years in Group 2.

In terms of obturation quality, when length of root canal filling was compared between two groups, under-filled cases in Group 1 were 8 (26.7%) compared to 4 (13.3%) in Group 2. When homogeneity (density) of root filling was compared between two groups, in Group 1, 6 (20.0%) had inadequate homogeneity as compared to 10 (33.3%) in Group 2. No statistical difference could be established between the two groups in terms of length and density of root canal filling in relation to canal preparation technique (p-value, > 0.05) [Table 1].

There were 6 (20.0%) cases with inadequate taper of root canal filling in Group 1 compared to 22 (73.3%) cases in Group 2. This difference was found highly significant (p-value, <0.001)

As per primary aim of the study, T-score was compared between the two study groups by using Chi square test. In group 1, 14 (46.7%) had obtained T-score 3 compared to 6 (20.0%) patients in Group 2. T-score indicating overall quality of obturation revealed statistically significant difference between the two groups

TABLE 1: COMPARISON OF OBTURATION QUALITY BETWEEN TWO GROUPS

	Points	Group 1 (Rotary) n= 30	Group 2 (Manual) n=30	p-value
Length of RCF				
Adequate	1	22(73.3 %)	22(73.3%)	0.06
Under filled	0	8(26.7 %)	4(13.3 %)	
Overfilled	0	0(0.0 %)	4(13.3 %)	
Homogeneity of RCF				
Adequate	1	24(80.0%)	20(66.7%)	0.24
Inadequate	0	6(20.0%)	10(33.3%)	
Taper of RCF				
Adequate	1	24(80.0%)	8(26.7%)	<0.001
Inadequate	0	6(20.0%)	22(73.3%)	

TABLE 2: COMPARISON OF T-SCORE BETWEEN TWO GROUPS

	Group 1 (Rotary) n=30	Group 2 (Manual) n=30	p-value
Score 0	0(0.0%)	2(6.7%)	0.025
Score 1	4(13.3%)	12(40.0%)	
Score 2	12(40.0%)	10(33.3%)	
Score 3	14(46.7%)	6(20.0%)	

(p-value, 0.025) [Table 2].

DISCUSSION

This current study was conducted to compare the radiographic obturation quality in single rooted teeth (incisors, canines, premolars) between two techniques of root canal preparation (rotary vs conventional method). No difference was observed between two groups in terms of length of the root canal fillings performed by manual instrumentation vs rotary systems. Frequency of cases that were adequately filled appeared to be same in both groups. Frequency of over filled cases was more in conventional group (manual) while frequency of under-filled cases was more in rotary group. This finding was in corroboration with the findings of Govindaraju et al. who reported the same results for the obturation quality in manual instrumentation vs rotary protaper system.[1]

This present study showed no difference between the two study groups in terms of homogeneity of the root canal filling. Frequency of cases with adequate density in rotary group was slightly greater than in conventional group (manual). This was in contrast to the study conducted by Robia G in 2011,in which reported frequency of cases with adequate density in rotary group was significantly higher than in manual group.[12]

According to this present study, the only parameter of obturation quality that showed significant difference between the two groups (manual vs rotary) was taper of the root canal filling. One of the main objective of canal preparation is to maintain the curvature of the canal with a continuous taper starting from canal orifice to the apical foramen without disturbing the overall natural framework of the canal.[9,13] This present study showed that adequate taper was significantly higher in rotary group than in conventional group (80.0% vs 26.7%). This finding was in accordance with the result of the study by Robia G, showing higher frequency of adequate taper in rotary vs manual group (90% vs 40%).[12] Another previous study by Parvathaneni KP showed that there was a significantly greater loss of working length while preparing the root canal with manual stainless steel files as compared to rotary files (0.53mm vs 0.27mm).[14] Various other studies on engine driven Niti files and rotary systems have also showed that use of these systems avoids procedural errors and helps to maintain natural framework and anatomy of the canal giving a better taper to the root filling.[15-20]

In our study, T-score indicating overall quality of obturation revealed statistically significant difference (p value, 0.025) between the two groups. Higher frequency of cases with T-score 3 (considered as having ideal obturation) were present in rotary group (46.7%) as compared to the manual group (20.0%). A previous study conducted by Robia G in 2011 also indicated a significant difference in T-score between rotary vs

manual group (p value, 0.001) concluding better quality of obturation in rotary group as compared to manual group. Another study by Govindaraju et al. also concluded more acceptable obturation quality with rotary instrumentation technique than manual method.

The current study has many advantages, firstly, this was a randomized control trial. Secondly, quality of the root canal treatment was measured in detail in terms of obturation quality.

There were few limitations of this study, overall obturation quality was assessed by intraoral periapical radiographs which only gives a two dimensional image of a three dimensional structure.

CONCLUSION

The T-score indicating overall obturation quality showed significant difference between manual vs rotary group. Although slight difference in terms of length and density was observed, however, taper and the overall quality of the obturation was better following rotary method for canal preparation as compared to manual technique.

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