Original Article

Comparing the Outcomes of Manual Instrumentation and Rotary Technique in Term of Instrumentation Time and Quality of Root Canal Obturation in Single Rooted Teeth

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ABSTRACT

Objective: To compare the outcomes of manual procedure with rotary technique in term of quality of root canal obturation in patients presented with single rooted teeth.

Study Design: Randomized controlled trial.

Place and Duration of Study: This study was conducted at the Military Dental Center Abbottabad, Pakistan from September 2019 to December 2019.

Materials and Methods: Eighty teeth of male and female patients with ages 20 to 60 years were enrolled and divided equally into two groups. Group I consist of 40 teeth and rotary method was applied. Group II with 40 teeth and manual instrumentation was done. Post obturation radiographs were done to examine the difference in length, density and taper of root canal filling by using T-score. Time taken for instrumentation and canal filling was recorded and compare the findings between both groups. SPSS version 24.0 was used for data analysis.

Results: There were 50 (62.5%) females and 30 (37.5%) male patient's teeth with mean age 32.25±11.68 years. We found a significant difference in term of obturation quality between both groups with p-value 0.008. In group I, 15 (37.5%) patients had T-score 2 and 20 (50%) had T-score 3 while in group II, 13 (32.5%) patients had T-score 2 and 8 (20%) patients had T-score 3, a significant difference was observed between both techniques with p-value <0.05. Instrumentation time was higher in group II as compared to group I (20.2 min Vs 10.6 min) with p-value <0.05.

Conclusion: Rotary method in term of quality of root canal obturation was better as compared to manual technique.

Key Words: Root canal, Rotary technique, Manual method, Obturation quality

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INTRODUCTION

Root canal obturation is an essential stage of root canal treatment aimed to seal the root canal in order to prevent future bacterial contamination/ recontamination of the canal space.[1] Many obturation methods have been introduced over the years, each attempting to provide a better seal of the root canal.[2]

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All have in common the assumption that the root canal is properly cleaned and shaped before the obturation stage. It is assumed by all that if the root canal is not adequately prepared and if tissue remnants and debris are present along the walls, proper sealing may be jeopardized, even with the best root canal filling method.[3,4] When simple, narrow, straight root canals with round cross-sections are considered, most current rotary nickel-titanium file systems will adequately clean and shape the canal with favorable results. The case is different in oval, flat, or curved root canals. In flat root canals, rotary file systems often fail to adequately clean and shape the canal, leaving ''fins'' that may have not been prepared.[2-4] In such a case, even warm gutta-percha obturation methods will fail to adequately seal the root canal (4). Clinical mesiodistal radiographs will fail to detect such discrepancy.

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 periapical 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.[5,6]

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.[7-10]

MATERIALS AND METHODS

After taking ethical approval, study was conducted at Military Dental Center Abbottabad, Pakistan from 1st September 2019 to 31st December 2019. A total of 80 patients of both genders with ages 20 to 60 years required root canal treatment for single rooted were included in this study. Patients detailed demographic were recorded after taking informed written consent. Patients with multi-rooted teeth, patients with apical pathology and those root canals with curvature more than 30 degrees were excluded. All the patients selected from OPD were randomly divided into two groups using computer generated randomization scheme. Group I consist of 40 teeth and rotary method (Universal Protaper Niti files, Dentsply Maillefer)) followed by F1, F2, or F3 Gutta Percha (Dentsply Maillefer) was applied. Group II with 40 teeth and manual instrumentation (circumferential filing technique) with K and H files (Mani, Japan) followed by cold lateral condensation technique was done. The sealer was calcium hydroxide based (Apexit-plus, Ivoclar Vivadent AG, Germany) and it was same for both groups. Post procedure intraoral periapical radiograph with paralleling device was done to examine the length, density and taper of root canal filling. T-score scoring system was applied, 0 score for inadequate and 1 for adequate. Patients with all three parameters were adequate marked as score 3, patients with two parameters were adequate marked as score 2, patients with any one parameter were adequate marked as score 1 and those with none of parameter was adequate marked as score 0. Time taken for instrumentation and canal filling was recorded. All procedures were done by same operator to reduce operator related bias. The periapical radiographs were evaluated by two different operators separately who were blinded to the procedure type. The intra observer differences were not significant. Data was analyzed by SPSS 24. Chi square test was done to compare the T-score and instrumentation time between both groups with p-value <0.05 was taken as significant.

RESULTS

In Group I, 28 (70%) patients were females and 12 (30%) were males with mean age 31.95±10.64 years and in group II, 22 (55%) patients were females and 18 (45%) patients were males with mean age 30.38±9.45 years. No significant difference was observed between both groups regarding age and gender (Table 1). According to the instrumentation time taken it was higher in group II as compared to group I (20.2 min Vs 10.6 min) with p-value <0.05. Mean filling time was also higher in group II as compared to group I (3.25 min Vs 1.6 min) with p-value <0.05 (Table 2).

Table No.1: Age and gender wise distribution between both groups

Variable	Group I	Group II	P-value
Age (years)	31.95±10.64	30.38±9.45	0.07
Gender			
Male	12 (30%)	18 (45%)	N/S
Females	28 (70%)	22 (55%)	N/S

Table No.2: Comparison of instrumentation time and canal filling time between both groups

Variable	Group I	Group II	P-value
Instrumentation Time	10.6	20.2	0.001
Filling Time	1.6	3.2	0.01

Table No.3: Comparison of length, density and taper of root canal filling between both groups

Variable	Group I	Group II	P-value
Length			
Adequate	31 (77.5%)	30 (75%)	N/S
Inadequate	9 (22.5%)	10 (25%)	
Density			
Adequate	34 (85%)	28 (70%)	N/S
Inadequate	6 (15%)	12 (30%)	
Taper			
Adequate	34 (85%)	11 (27.5%)	0.0001
Inadequate	6 (15%)	29 (72.5%)	

Table No. 4: Quality of obturation regarding T-score between both groups

T-score	Group I	Group II	P-value
3	20 (50%)	8 (20%)	0.0001
2	15 (37.5%)	13 (32.5%)	
1	5 (12.5%)	16 (40%)	
0	0	3 (7.5%)	

According to the post obturation quality of root canal we found that 31 (77.5%) in group I and 30 (75%) patients in group II showed adequate length of root canal filling while 9 (22.5%) and 10 (25%) patients had inadequate in group I and II. No significant difference was observed regarding length of root canal filling(RFC) between both groups with p-value 0.2. No significant difference was observed regarding density of RCF between both groups (p-value >0.05), in group I 34 (85%) patients and in group II 28 (70%) patients

were adequate while 6 (15%) and 12 (30%) patients showed inadequacy in group I and II. We found a significant difference regarding taper of root canal filling between both groups with p-value 0.0001 (34 (85%) in group I and 11 (27.5%) in group II had adequate findings while 6 (15%) and 29 (72.5%) had inadequacy in group I and II (Table 3). In group I, 15 (37.5%) patients had T-score 2, 20 (50%) had T-score 3, 5 (12.5%) had T-score 1 and none of patient had T-score 0. In group II 13 (32.5%) patients had T-score 2, 8 (20%) patients had T-score 3, 16 (40%) had score 1 and 3 (7.5%) had score 0. A significant difference was observed between both groups regarding T-score with p-value 0.01 (Table 4)

DISCUSSION

In present study 80 patients of both genders were enrolled to compare the outcomes of rotary method with manual K and H file instrumentation in term of quality of obturation. There were 50 (62.5%) female and 30 (37.5%) male patient's teeth with mean age 32.25±11.68 years. These results were similar to the study by Jalees et al[11] regarding comparison of rotary procedure versus manual method and they reported female patients were high in numbers 56.67% as compared to males and average age of patients was 33.3 ± 7.4 years in group I and 37.6 ± 12.9 years in group II.

In present study we found that patients treated with rotary method had less instrumentation time as compared to manual k-file technique with p-value <0.001. A study conducted by Babaji et al[16] reported that manual technique taking higher instrumentation time as compared to rotary method. They reported a significant difference between both techniques with p-value <0.05. In our study we found no significant difference was observed regarding length of root canal filling between both groups with p-value 0.2. 31 (77.5%) in group I and 30 (75%) patients in group II showed adequate length of root canal filling while 9 (22.5%) and 10 (25%) patients had inadequate in group I and II. We found no significant difference was observed regarding density of RCF between both groups (p-value >0.05), in group I, 34 (85%) patients and in group II 28 (70%) patients were adequate. These results were similar to many of previous study in which no significant difference was observed between rotary and manual method regarding length of Root canal filling and density of RCF.[12-14]

We found a significant difference regarding taper of root canal filling between both groups with p-value 0.0001 (34 (85%) in group I and 11 (27.5%) in group II had adequate findings while 6 (15%) and 29 (72.5%) had inadequacy in group I and II).These results were similar to the study by Jalees et al[11], in which they reported a significant difference regarding taper of RCF between both methods with p-value <0.05. Many of other studies showed significant improvement regarding taper of root canal filling after applying rotary methods and manual technique. These studies were reported that rotary method was much better and effective as compared to manual technique.[15-17]

In present study we used scoring system (T-score) to compare the quality of root canal obturation between both procedures and we found a significant difference between both procedures with p-value 0.0001. We found that 87.5% patients who received rotary method had T-score 2 and 3 and none of patient had score 0 while in patients whom were received manual technique 13 (32.5%) patients had T-score 2, 8 (20%) patients had T-score 3, 16 (40%) had score 1 and 3 (7.5%) had score 0. These results were similar to several previous study in which rotary method showed better quality of root canal obturation as compared to manual technique.[18-21] A study by Samady et al[22] reported rotary method had better obturation quality as compared to manual K-files technique.

CONCLUSION

Rotary method in term of quality of root canal obturation was better as compared to manual technique. We found no significant difference regarding length and density of root canal filling between both procedures however, regarding taper of RCF a significant better result was observed in rotary method as compared to manual technique.

Author's Contribution:

Concept & Design of Study:	Hafiz Rabbi ul Ehsan
Drafting:	Dil Rasheed, Muhammad Junaid
Data Analysis:	Beenish Abbas, Faisal Nawaz Khan, Zahid Dildar
Revisiting Critically:	Hafiz Rabbi ul Ehsan, Dil Rasheed
Final Approval of version:	Hafiz Rabbi ul Ehsan

Conflict of Interest: The study has no conflict of interest to declare by any author.

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