

# Compare the Quality of Root Canal Obturation by Intraoral Periapical Radiographs in Single Rooted Teeth Prepared by Manual Technique Versus Rotary Method

Ayesha Khan<sup>1</sup>, Fayyaz Alam<sup>2</sup> and Osama Khattak<sup>2</sup>

## ABSTRACT

**Objective:** To compare the quality of root canal obturation by intraoral periapical radiographs in single rooted teeth prepared by manual technique versus rotary method.

**Study Design:** Randomized controlled trial study.

**Place and Duration of Study:** This study was conducted at the Study was conducted at Punjab Dental Hospital, Lahore for six months duration from July to December, 2020.

**Materials and Methods:** Hundred teeth of male and female patients with ages 20 to 65 years were enrolled and divided equally into two groups. Group I consist of 50 teeth and rotary method was applied. Group II with 50 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.

**Results:** There were 64 (64%) females and 36 (36%) male patient's teeth with mean age  $33.52 \pm 10.86$  years. We found a significant difference in term of obturation quality between both groups with p-value 0.008. In group I 19 (38%) patients had T-score 2 and 24 (48%) had T-score 3 while in group II 17 (34%) patients had T-score 2 and 11 (22%) patients had T-score 3, a significant difference was observed between both techniques with p-value  $< 0.05$ .

**Conclusion:** Compared to manual approach, the root system in terms of root canal shutting consistency was higher.

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

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## INTRODUCTION

A fundamental phase of root canal care is the sealing of the root canal to avoid potential bacterial contamination/recontamination of the canal space.<sup>1</sup> Over the years, several sealing techniques have been developed to provide a stronger seal for the root canal.<sup>2</sup> Both have in common the belief that before the sealing process, the root canal is correctly cleaned and formed. Everyone assumes that when the root channel is not properly prepared and tissue residuals and waste are

found along the walls, proper screening even with the best root channel filling system can be compromised.<sup>3,4</sup> If you take into account plain, narrow, straight root channels with round cross sections, most current rotary nickel-titanium file systems can clean and form the channel properly. The case in circular, smooth or curved root canals is different. Rotary file systems also struggle to clean and shape the canal properly in flat root canals, leaving "fins", which may not be prepared. [2-4] [2-4] Even warm guttapercha shutting methods will not properly screen the root canal in this situation.<sup>4</sup> Such discrepancies are not detected by clinical mesiodistal radiographs.

The quality of the shutter is one of the characteristics of root canal care prognosis. A periapical radiographic assessment, the most popular form of assessment to date, is one way to measure the standard of endodontic care. Three parameters including volume, homogeneity and the taper of the root canal filling visible on radiographs are used to determine the radiographic efficiency of endodontic processing.<sup>5,6</sup>

Although several studies were conducted among undergraduates, graduates and postgraduates with different methods of channel preparation for the quality assessment (manual/rotative), their results are very variable.<sup>7-10</sup>

<sup>1</sup>. Department of Operative Dentistry, De'Montmorency College of Dentistry, Lahore / Dental Surgeon Children Hospital, Lahore

<sup>2</sup>. Department of Operative Conservative Dentistry College of Dentistry Jouf University Saudi Arabia

Correspondence: Dr. Ayesha Khan, Resident Operative Dentistry, De'Montmorency College of Dentistry, Lahore / Dental Surgeon Children Hospital, Lahore

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The present study was conducted aimed to examine the quality of root canal obturation by using rotary method and manual procedure.

## MATERIALS AND METHODS

This study was conducted at Punjab Dental Hospital, Lahore for six months duration from July to December, 2020. A total of 100 patients of both genders with ages 20 to 65 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 with sterile canals were excluded.

All the patients selected from OPD were randomly divided into two groups using computer generated randomization scheme. Group I consist of 50 teeth and rotary method (ProtaperNiti) followed by Gutta Percha (Dentsply Maillefer) was applied. Group II with 50 teeth and manual instrumentation with K and H files followed by cold lateral condensation technique was done. Post procedure intraoral periapical radiograph 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. Data was analyzed by SPSS 24. Chi square test was done to compare the T-score between both groups with p-value <0.05 was taken as significant.

## RESULTS

In Group I 37 (74%) patients were females and 13 (26%) were males with mean age  $32.59 \pm 11.46$  years and in group II 27 (54%) patients were females and 23 (46%) patients were males with mean age  $31.83 \pm 10.54$  years. No significant difference was observed between both groups regarding age and gender (Table 1)

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

Characteristics	Group I	Group II	P-value
Age (years)	$32.59 \pm 11.46$	$31.83 \pm 10.54$	0.07
Gender			
Male	13 (26%)	23 (46%)	N/S
Females	37 (74%)	27 (54%)	N/S

According to the post obturation quality of root canal we found that 39 (78%) in group I and 37 (74%) patients in group II showed adequate length of root canal filling while 11 (22%) and 13 (26%) patients had inadequate in group I and II. No significant difference was observed regarding length of Root canal filling 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 42 (84%) patients and in group II 36 (72%) patients were adequate while 8 (16%) and 14 (28%) 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 (42 (84%) in group I and 15 (30%) in group II had adequate findings while 8 (16%) and 35 (70%) had inadequacy in group I and II). (Table 2)

In group I 19 (38%) patients had T-score 2 and 24 (48%) had T-score 3, 7 (14%) had T-score 1 and none of patient had T-score 0. In group II 17 (34%) patients had T-score 2 and 11 (22%) patients had T-score 3, 19 (38%) had score 1 and 3 (6%) had score 0. A significant difference was observed between both groups regarding T-score with p-value 0.01 (Table 3)

**Table No. 2: Comparison of length, density and taper of root canal filling between both groups**

Variable	Group I	Group II	P-value
Length			
Adequate	39 (78%)	37 (74%)	N/S
Inadequate	11 (22%)	13 (26%)	
Density			
Adequate	42 (84%)	36 (72%)	N/S
Inadequate	8 (16%)	14 (28%)	
Taper			
Adequate	42 (84%)	15 (30%)	0.0001
Inadequate	8 (16%)	35 (70%)	

**Table No. 3: Quality of obturation regarding T-score between both groups**

T-score	Group I	Group II	P-value
3	24 (48%)	11 (22%)	0.0001
2	19 (38%)	17 (34%)	
1	7 (14%)	19 (38%)	
0	0	3 (6%)	

## DISCUSSION

80 patients of both sexes were enrolled in this study to compare rotating process results in terms of seal consistency with manual K and H file instrumentation.. There were 64 (64%) female teeth and 36 (36%) male teeth with a mean age of  $33.52 \pm 10.86$  years. It was higher than the published frequencies of Er et al. (70%), Lupi-Pegurier et al. (39%), Chueh et al. (62%) and Eleftheriadis and Lambrianidis (63%).<sup>11-14</sup>

In our sample 39 (78%) in Groups I and 37 (74%) in Group II patients showed sufficient root canal filling, while 11 (22%) and 13 patients (26%) in Group I and II showed insufficient root canal filling time. In relation to the root channel filling length of both groups with p-value 0.2 there was no important difference. No substantial difference in RCF density was found between all the p-value (>0,05) patient groups, in Group I 42 (84%) and in Group II 36 (72%) patients,

while in Group I and II 8 (16%) and 14 (28%) patients were inadequate. Kirkevang et al. reported that insufficient density could result in the failure of RCT due to root filling micro leakage.<sup>15</sup> Similarly, Eriksen & Bjertness suggested that apical periodontitis was more prevalent in low density root-filled teeth. The results of this study showed that in the case of rotary and manual canal preparation technique, sufficient density without voids was obtained in 25 teeth (83.3%) with a similar density of 14 teeth (46.7%), Yoldas et al. reported a sufficient density with no voids of 64% and Sagsen et al. reported 53%<sup>16-17</sup>.

We found that there was a substantial difference in root canal taper between the two p-value groups 0.0001 (42 (84%) in Group I and 15(30%) in Group II, while 8 (16%) and 35 (70%) had insufficient results in groups I and II). These findings were similar to Jalees et al's study<sup>18</sup>, which showed a major difference in RCF taper between the two p-value methods <0.05. Many other studies have demonstrated substantial changes in the root canal filling taper following the implementation of rotation methods and manual technology. These studies showed that rotational methods were much better and more successful than manual methods<sup>19,20</sup>.

We have used a rating system (T-score) in this analysis to assess the consistency of root canal shutting between the two procedure and find a substantial difference between the p-value 0.0001 procedures. 86 percent of patients receiving rotary care received T-score 2 and 3 and none received 0 while manual technique was used for patients receiving In 17 patients (34%) T scores were 2 and in 11 patients (22%) T scores were 3; in 19 patients (38%) scored 1 and in 3 (6%), scored 0. These findings were close to the results of several previous studies in which the rotary method showed better root canal filling efficiency than manual method<sup>21</sup>. The rotary method mentioned by Samady S et al<sup>22</sup> was better shut down than manual K-files.

Pettiette et al. and Gluskin et al. stated that channels were created with fewer procedural mistakes and more effective treatment when dental students used both hand or rotary nickel – titanium instruments, compared with standard stainless steel instruments<sup>23,24</sup>.

## CONCLUSION

Compared to the manual approach, the root system in terms of root canal shutting consistency was higher. We did not find substantial variations in root canal filling length and density between the two procedures, however in comparison with hand-held technology there was a significant improvement in RCF taper.

### Author's Contribution:

Concept & Design of Study: Ayesha Khan  
 Drafting: Fayyaz Alam  
 Data Analysis: Osama Khattak  
 Revisiting Critically: Ayesha Khan,

Fayyaz Alam

Final Approval of version: Ayesha Khan

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

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