# COMPARISON OF WORKING LENGTH IN CURVED MESIAL CANALS OF MANDIBULAR MOLAR BETWEEN PRE-FLARED AND NON-FLARED GROUP

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### ABSTRACT

The aim of this study was to compare the working length in the curved mesial canals of mandibular molars between pre-flared and non-flared groups. It was a comparative study which was carried out at Dental Department of PIMS (Pakistan Institute of Medical Sciences) Islamabad from 2003 to 2004.

A total of 60 patients were divided equally into pre-flared and non-flared groups. In both groups a 15 # K file was used for the measurement of working length but in the pre-flared group the coronal portion of the canal was flared with Hedstrom files (25-55) or Gates Glidden Drills from # 02 to # 05 before inserting the # 15 K file. Then the tooth was radiographed at this moment and the distance between the tip of the file and the radiographic apex. The location of the tip was classified as a) within 1 mm of the radiographic apex b) more than 1 mm of radiographic apex c) over extended, beyond the radiographic apex.

In the non-flared group 33.3% of the cases belonged to group (a), 40% to group (b) and 26.7% to group (c). In the pre-flared group 73.3% of the cases belonged to group (a), 10% to group (b) and 16.7% to group (c).

It was concluded that when the coronal portion of the canal is constricted, then the clinicians cannot discern the accuracy of what they feel apically because quite often the file bends or stucks more coronally than apically. When the coronal portion of the curved canal is pre-flared or prepared then it greatly improves the access to apical portion of curved canal and thus to the apical constriction, which is an apical reference for correct working length determination, by removing the dentinal hindrances in the coronal portion of the curved canals. Thus pre-flaring is a highly recommended procedure, especially in curved canal for correct working length determination.

Key words: Working length, Endodontics, Curved canals, Pre-flaring

### INTRODUCTION

Correct working length is essential for the success of endodontic treatment.<sup>1-4</sup> The cleaning, shaping and obturation of the root canal system cannot be accomplished accurately unless the working length is determined precisely.<sup>5-7</sup>

If one fails to determine the working length accurately, it may lead to incomplete instrumentation and

under filling which may results in problem like persistent pain and discomfort from inflammation of retained pulp tissues.<sup>1,2,4,8</sup>

Failure to accurately determine and maintain working length may result in the length being too long and may lead to perforation through the apical constriction. Destruction of the constriction may lead to overfilling or overextension and an increased incidence of

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postoperative pain. In addition, one might expect a prolonged healing period and lower success rate due to incomplete regeneration of cementum, periodontal ligament, and alveolar bone.<sup>8,9,10,11</sup> In 1955, Kutler stated that the ideal place to end root canal treatment was the cementodentinal junction.<sup>12</sup> It is where the pulp tissue changes into the periapical tissue<sup>13</sup> as it is a histological landmark, which cannot be felt clinically or seen radiographically. When the canal preparation ends at this point the area behind it being avascular helps in the elimination of the pathogenic microorganisms. From the clinical point of view, it is advantageous to end all preparation at this point because it is a morphological point that can be felt by the clinician.<sup>2</sup> There has been debate as to the optimal length of canal preparations and the optimal level of canal obturation.<sup>14</sup> Most dentists agree that the desired end point is the apical constriction, which is not only the narrowest part of the canal<sup>15</sup> but a morphologic landmark<sup>16,17,18,19</sup> that can help to improve the apical seal. The apical constriction normally is located within the apical 2 mm of most teeth.<sup>1</sup> One study showed that early detection of the apical constriction is not a predictable technique<sup>20,30</sup> especially in severely constricted canals, which are often narrower near the orifice, due to the chronic calcific pulpal degeneration in the pulp chamber.<sup>2</sup> If the shape behind the constriction is created, it becomes significantly easier to locate the constriction by tactile sense using precurved patency files.  $^{\scriptscriptstyle 2,21,22}$  If the coronal portion of the canal is not constricted, an experienced clinician may detect an increase in resistance as the file approaches the apical 2 to 3 mm. In this region the canal frequently constricts before exiting the root. In the curved canals it is very difficult to achieve the correct working length. In such cases if the coronal portion of the canal behind the curvature is shaped by pre-flaring then it makes easier to achieve the ideal working length of 1-2 mm short of the apex.<sup>2,23,24,29</sup> If the curved canals were pre-flared, it was possible for an expert to detect the apical constriction, a reference for correct working length, in about 75% of cases.<sup>25,30</sup> If the canals were not pre-flared, determination of the apical constriction i.e the correct working length was possible in only about one third of cases.<sup>26,31</sup> Once the apical constriction is established, it is extremely important to monitor the working length periodically especially in the curved canals since a curved canal is straightened ("a straight line is the shortest distance between two points").27,28 Khan I U has found that pre-flaring greatly improves the quality of the coronal part of curved canals for correct working length determination.<sup>29,30</sup> Thus pre-flaring is highly recommended procedure, especially incurved canals, for the detection of the apical constriction, a reference for the determination of the correct working length.

## METHODOLOGY

The total 60 patients both males and females age 30 to 35 years were selected randomly from the OPD of the dental department of Pakistan Institute of Medical Sciences, Islamabad. Patients were equally divided into pre-flared and non-flared groups. In the non-flared group first of all first permanent mandibular molar was anaesthetized then rubber dam was applied and the access cavity was prepared and the pulp chamber opened. Canals were located and the chamber was thoroughly debried of the pulp tissue. A No 15 K file (Mani Corporation, Japan) was inserted into the canals upto the length estimated from the diagnostic radiograph. In pre-flared group coronal portion of the mesial root canals of first permanent mandibular molars from the occlusal reference to the length of curvature or straight part of the mesial canals was prepared using Hedstrom file (Mani Corporation Japan) upto No 55. Sodium hypochlorite and hydrogen peroxide were used alternately as irrigants during flaring procedure. Then a No 15 K file was inserted into the pre-flared mesial canal and the tooth was radiographed to estimate the working length. Two periapical radiographs were taken one with straight and other with mesial shift technique to estimate the working length. Two periapical radiographs were taken by using an intra oral film holder to allow accurate reproduction of periapical area and the least amount of distortion. The distance from the tip of the file to the apex of the root was measured radiographically. The readings were classified according to the method described by Stabholz et al<sup>11</sup> as: a) within 1 mm of the apex, b) more than 1 mm way from the apex, c) overextending the length of the canal. The readings were noted down in the proforma.

The data were analyzed on the computer by using software SPSS version 10. Chi square test was applied to calculate the significant difference between the working length of the two groups.

### RESULTS

In the non-flared group 33.3% of the cases were belonging to group (a), 40% to group (b), 26.7% to group (c). In the pre-flared group 73.3% of the cases were belonging to group (a), 10% to group (b), 16.7% to group (c).

	Pre Flared		Non Flared		Total	
Groups	No of Pts	%	No of Pts	%	No of Pts	%
Within 1 mm	10	33.3%	22	73.3%	32	53.3%
More than 1 mm	12	40.0%	3	10.0%	15	23%
Over extended	8	26.7%	5	16.7%	13	21.7%
Total	30	100%	30	100%	60	100%

# TABLE 1: FREQUENCY AND NUMBER OF PATIENTS IN DIFFERENT GROUP OF FILE TIPS TO RADIOGRAPHIC APEX LENGTH

### TABLE 2: CHI SQUARE

	Value	df	Asymp. Sig (2-sided)
Pearson Chi-sqaure	10.592	2	.005
Likelihood ratio	11.093	2	.004
No of valid cases	60		

a. 0 cells (.0% have expected count less than 5. The minimum expected count is 6.50.

P value less than .005



Fig 1: Comparison of the number of cases in various groups of non-flared and pre-flared canals

# DISCUSSION

In the curved canals the determination of the accurate working length is a challenging task. The correct working length determination is very critical for the success of endodontic therapy.<sup>1-4</sup> Until and unless correct working length is not determined, other steps of the root canal therapy like cleaning, shaping and obturation of the root canal system cannot be accomplished accurately.<sup>5-7</sup> An accurate coronal access to the pulp chamber is very important to provide a

straight line pathway into the canal orifice, before determining a definitive working length. However, the modification in the access preparation may be required to permit the instrument to penetrate, unimpeded, to the apical constriction i.e an apical reference for the correct working length during the cleaning and shaping can be a very frustrating procedural error. Once the working length has been determined accurately in the curved canals it is extremely important to monitor the working length periodically during the rest of procedure, since the working length changes as a curved canal is straightened. In the curved canal the loss of accurate working length can also be related to the accumulation of the dentinal debris and pulpal debris in the apical 2 to 3 mm of the canal due to constricted coronal portions of the canals. If the clinician fails to accurately determine and maintain the working length, it will result in the too long working length, which leads to perforation through the apical constriction and also the overfilling and overextension and increased incidence of postoperative pain. If the clinician fails to accurately determine and maintain the working length it can also result in too short a working length it can also result in too short a working length, which leads to incomplete cleaning and shaping and subsequently underfilling and persistent discomfort and pain. If the coronal portion of the curved canals is pre-flared, then it is possible for an experienced clinician to detect the apical constriction which is an apical reference for the correct working length determination. A study similar to the present study has shown that after the preflaring of the coronal portion of the curved canals the tip of instruments reached within 1 mm of the radiographic apex in 75% of the cases. But without preflaring of the coronal portion of the curved canals the tips of instruments were within 1 mm of the radiographic apex in only 32% of the cases. Ibarrola and associates had also done a similar study using the root zx apex locator.<sup>21,30</sup> They concluded that they got better results by using the apex locators, when the canals were pre-flared, because the file which was inserted into the canals for the working length determination would go deeper. Khan IU<sup>29,32</sup> showed that in the nonflared group, in 31.4% of the cases the tip of the instrument was within 1 mm of the radiographic apex. In 40% of the cases the tip of the instrument was more than 1 mm of the radiographic apex. In 28.57% of the cases the tip of the instrument was overextending beyond the radiographic apex. In the pre-flared group, in 80% of the cases the tip of the instrument was within 1 mm of the radiographic apex. In 5.7% of the cases the tip of the instrument was more than 1 mm of the radiographic apex. In 14.28% of the cases the tip of the instrument was overextending beyond the radiographic apex. Present study has shown that, in the non-flared group, in 33.3% of the cases the tip of the instrument was placed within 1 mm of the radiographic apex. Thus this study supports the results of the previous studies which were carried out on similar technique.

Early removal of restrictive dentin in the coronal 2/ 3<sup>rd</sup> gives the clinician more tactile sensation of the apical part. A pre-flared canal allows for more efficient debris removal. With coronal restrictive dentin removed, a # 10 and # 15 file readily moves into the apical area reducing the need and expense to use # 6 and # 8 files.

The need for precurving the file is reduced. Fewer files need precurving and those that do aren't curved as much.

### CONCLUSION

When the coronal portion of the canal is constricted, then the clinicians cannot discern the accuracy of what they feel apically because quite often the file bends more coronally than apically. However, this study showed that when the coronal portion of the curved canal is pre-flared it greatly improves the access to apical portion of curved canal and thus to the apical constriction, which is an apical reference for correct working length determination. Thus preflaring is a highly recommended procedure especially in curved canal for correct working length determination.

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