



Effect of Preflaring on Working Length Determination: An In Vivo Study

ARJANG FALLAHDOST, DDS; M. SADEGH NAMAZIKHAH, DMD, MSED;
MAHSHID SHEIKHOLES LAAMI, DDS; AND KAMBIZ TAVAKKOLI, DDS

ABSTRACT This study is designed as an in vivo study to evaluate the impression of the preflaring method on working length determination in curved canals.

AUTHORS

Arjang Fallahdoost, DDS, is an assistant professor, endodontic department, School of Dentistry, Azad University, Tehran, Iran.

M. Sadegh Namazikhah, DMD, MSED, is professor and former chair of Department of Endodontics, and director of the Advanced Endodontic Program, School of Dentistry, University of Southern California.

Mahshid Sheikholeslaami, DDS, is an assistant professor, endodontic department, School of Dentistry, Azad University, Tehran, Iran.

Kambiz Tavakkoli, DDS, is with the endodontic department, School of Dentistry, Azad University, Tehran, Iran.

Forty mandibular first molars with apical curvatures of 30 to 40 degrees were selected. The samples were randomly categorized to two groups each containing 20 teeth. A file in each mesial canal was measured, one with and one without preflaring.

In the first group, the initial instrumentation with preflaring on the mesiobuccal canal and in the second group without preflaring on mesiolingual canals were performed. A No. 15 file was inserted in the canals until the apical constriction could be felt (tactile sense) and a radiograph was prepared. Paired T-tests were used to analyze the file tip location and distance from apices.

Applying the early preflaring method, the file penetration was sig-

nificantly closer to the true working length ($p < 0.001$). Compared to the canals which early preflaring method was not applied, and file penetration decreased and there proved to also be a significant difference ($p < 0.000$).

Working length determination has an essential impression on root canal treatment prognosis. If the working length is estimated to be short, the preparation will also be of inadequate length and will finally lead to treatment failure.¹⁻³

Morgan and Montgomery presented the crown-down technique in 1984.⁴ This technique indicates the cleaning and shaping of the coronal portion of the canal and incremental progression to the apical area. The aim is to decrease the microorganisms which may be pushed apically later.⁵

In a study performed by Stabholz, Rotstein, and Torabinejad in 1995 on 120 adult patient root canals, it was shown that in 76 percent of the teeth that underwent preflaring, the apical constriction was felt.⁶

Baumgartner, Marshal, and Davis published a study in 2002 that showed the variation in the working length of root canals with early coronal flaring has been at minimum during the instrumentation.⁷

Considering the previously mentioned descriptions, this study was designed to evaluate the impression of the preflaring method using Protaper rotary files on working length determination, to compare the preflared and nonpreflared canals.

Materials and Methods

This clinical trial study was performed on 40 mandibular molars with a 30- to 40-degree apical curvature (Schneider's method) in the patients' mesial root of the molar teeth. The patients were selected from the endodontics department at the Islamic Azad dental school.

First, a radiograph with paralleling technique was taken using Endoray (Dentsply, Rinn), then the apical curvature was measured with Schneider's index to ascertain the inclusion criteria. Next, case selection, anesthesia, access cavity preparation, and isolation were performed on every patient. To instrument the coronal portion, Protaper S1, and SX rotary files (Maillefer, Swiss) were used.

One mesial root canal (mesiobuccal or mesiolingual) was randomly chosen, and using the aforementioned files, two-thirds of the canal length was inactively prepared. A No. 15 file (K-file Maillefer) was inserted in the canal, concerning the reference point, until the apical constriction was felt (tactile sense). Likewise, in the other mesial canal, which has no preflaring, another

TABLE 1

Working Length in the Group With Preflaring

Index	X+sd	X+ sd differences	Paired T-test result
Observational method			
Preflaring (n=40)	20.01+ 1.4	-1.2+0.8	P<0.001
True working length	20.21+1.3		

TABLE 2

Working Length in the Group Without Preflaring

Index	X+sd	X+ sd differences	Paired T-test result
Observational method			
Without preflaring (n=40)	18.7+ 1.4	-2.5+1.1	P<0.000
True working length (n=40)	20.21+1.3		

A significant difference was shown in the measured working length (p<0.000).

No. 15 file was inserted. A radiograph was taken using the Endoray, applying the X-rays 15- to 20-degrees mesially to the original. The working length for each canal and tooth was recorded and analyzed using Paired T-test.

Results

Forty patients who were referred to the endodontics department were studied. **TABLE 1** shows a significant difference between the working length measured on preflared samples and the true working length (p<0.001).

TABLE 2 reveals a significant difference between the measured working length on samples not undergoing the preflare process (p<0.000) while **TABLE 3** compares the two experimental groups with and without preflaring.

TABLE 4 reveals the file location with apical index in the two groups (preflared and without preflaring). In 29 cases (72.5 percent) with preflaring method the file was located within 1 mm to apex, and in 6 cases the file passed the apex. Meanwhile in the 40 canals without preflaring, 11 cases (27.5 percent) were within 1 mm from apex and 19 were more

than 1 mm from the apex. In 10 cases (25 percent) the file passed the apex.

Discussion

This study revealed that with early preflaring in root canal preparation, file penetration would be closest to the true working length. On the other hand, in canals without preflaring, file penetration is less and the difference is significant (p<0.000).

This study also proved that in working length determination without preflaring in only 27.5 percent of cases the file will be located within 1 mm from the radiographic terminus. In all other cases, either the file cannot reach the radiographic terminus or will pass it. These conclusions are in agreement with Stabholz studies.⁶ This can be interpreted as the canal entrance or the coronal part inhibit the file from reaching the apex and give a false feeling of apical constriction.

On the contrary, removal of the coronal part by preflaring will enhance the tactile sense to apical constriction and the file will have retention in this location. Hence, in 72.5 percent of cases apical constriction was felt within 1 mm of the apex and the number of files pass-

TABLE 3

Comparing the Two Experimental Groups With and Without Preflaring

Index	X+sd	X+ sd differences	Paired T-test result
Observational method			
Preflared (n=40)	20.01+1.4	1.3+0.8	P<0.000
Nonpreflared (n=40)	18.7+ 1.4		

TABLE 4

The Location of File Tip in Two Experimental Groups

Distance to apex	Preflared (n=40)		Nonpreflared (n=40)	
	Number	Percentage	Number	Percentage
Within 1 mm	20	72.5%	11	27.5%
More>1 mm	5	12.5%	19	47.5%
Overextended	6	15%	10	25%

ing the apex had considerably decreased. This will lead to a prevention of the debris harbor throughout the apex.⁸

This study is also in agreement with Davis et al., Schroeder et al., and Contreras et al. who proved that estimated working length will decrease while instrumentation is performed, early coronal flaring was more precise, and the working length had the lowest variation while preparation was done.^{7, 9, 10} More importantly, Ibarrola et al. found that flaring at the coronal before working length determination with an electronic apex locator significantly improves the accuracy with which the apex locator is able to identify apical constriction.⁵

Luiten verified that, apical transportation in preflared canals is minimal and will lead to better shaping.¹¹ This too is in agreement with the present study, which also showed that early coronal preflaring assists in canal cleaning and enhances the tactile sense to apical constriction. It will also lower the zipping possibility which can overextend leading to overfilling, which will in turn cause post-treatment pain and discomfort and minimize treatment failure. ■■■■

REFERENCES

- Walton RE, Torabinejad M, Principles and practice of endodontics, third ed., Philadelphia, WB Saunders, 200-2, 2002.
- Weine FS, Endodontic therapy, fourth ed., St. Louis, CV Mosby, 240-1, 2004.
- Jubach T, Tactile assist to working length determination. *Practical Endod* April-May 28-30, 1995.
- Morgan LA, Montgomery S, An evaluation of the crown-down pressureless technique. *J Endod* 10(10):491-3, 1984.
- Ibarrola JI, Chapman BL, Howard JH, Knowles KI, Ludlow MO, Effect of preflaring on root zx apex locators. *J Endod* 25(9):625-6, 1999.
- Stabholz A, Rotstein L, Torabinejad H, Effect of preflaring on tactile detection of the apical constriction. *J Endod* 21(2):92-4, 1995.
- Davis D, Marshal JG, Baumgartner JC, Effect of early coronal flaring on working length change in curved canals using rotary nickel titanium versus stainless steel instruments. *J Endod* 28(6):438-41, 2002.
- Leeb J, Canal orifice enlargement as related to biomechanical preparation. *J Endod* 9(11):463-70, 1983.
- Schroeder KP, Walton RE, Rivera EM, Straight line access and coronal flaring: effect on canal length. *J Endod* 28(6):474-6, 2002.
- Contreras MA, Zinman EH, Kaplan SK, Comparison of the first file that fits at the apex, before and after early flaring. *J Endod* 27(2):113-6, 2001.
- Luiten DJ, Morgan LA, Baumgartner JC, Marshal JG, Comparison of four instrumentation techniques on apical transposition. *J Endod* 21(1):26-32, 1995.

TO REQUEST A PRINTED COPY OF THIS ARTICLE, PLEASE

CONTACT Arjang Fallahdoost, DDS, P.O. Box, 19585/175, Tehran, Iran, or fax a request to 098-21 22564577.