

## A comparison of Mtwo rotary file with K-file on negotiation of second mesiobuccal canal in maxillary first molar: A clinical study

Kiamars Honardar<sup>1\*</sup> DMD, MS, Nahal Vesal<sup>2</sup> DMD, MS, Faeze Hamze<sup>3</sup> DDS, Kiumars Nazarimoghadam<sup>4</sup> DMD, MS, Hossein Labaf<sup>1</sup> DMD, MS, and Laila Shakeri<sup>1</sup> DMD, MS

1. Assistant Professor of Endodontics, Dental School, Shahed University, Tehran, Iran.

2. Endodontist

3. General Practitioner

4. Associate Professor of Endodontics, Dental School, Shahed University, Tehran, Iran.

### Abstract

**Introduction:** This study was carried out to compare the capability of K-files with Mtwo rotary file in terms of negotiation as well as depth of penetration in second mesiobuccal (MB2) canal of maxillary first molar.

**Materials and Methods:** A total of 32 MB2 canal of maxillary first molars having different root curvatures (not more than 30 degree) and root lengths were selected and then detected by K-file #10, #8 and #6. Based upon file penetration the samples were assigned into four groups. Group A: K-file #10 penetrate >2mm into coronal third, group B: K-file #10 could penetrate <2mm into coronal third, continue proceeding with #8 which had >2mm penetration, group C: K-files #10 and 8 could penetrate <2mm, continue proceeding with #6 for deeper penetration, and group D: Mtwo file #10/.04 was applied into all three above groups until resistance was felt. Finally, accurate working lengths at each group after K-file #10 insertions into the canal were determined radiographically. The mean depths of root canal penetration were analyzed statistically using Duncan test by SAS software (version 9.1) in GLM procedure.

**Results:** The mean of initial penetration for #10 Mtwo files was 19.16 mm, whilst it was 7.72 mm for K-File #6, 10.72 mm for K-File #8, and 12 mm for K-File #10. The difference between Mtwo rotary files and hand K-Files was statistically significant ( $P < 0.01$ ).

**Conclusion:** Mtwo rotary files could be an efficient substitute for hand files to negotiate MB2 canal both more easily and rapidly. To our knowledge, it is the first time that a NiTi rotary file showed success in negotiation of any canal. (*Iranian Endodontic Journal* 2008;3:29-32)

**Keywords:** First molar, Maxillary, MB2, Mtwo file, Negotiation, Root canal.

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\*Correspondence: Dr. Kiamars Honardar, Endodontic Dept., Shahed Dental School, Shahed University, Tehran, Iran. Email: Kiamarshonardar@gmail.com

### Introduction

For clinician, the main problem to obtain success in treating maxillary molars is the inability to negotiate, instrument and obturate the second mesiobuccal (MB2) canal.

This canal has been shown to be present in high frequency of maxillary molars. Most *in vitro* studies showed, the presence of the MB2 canals ranging from 51.5% to 95.2%. Whilst *in vivo* studies showed the presence of the MB2 canals in the maxillary first molar ranging from 18.6% to 77.2% (1-3). The MB2 canal has a very small

diameter and is a tortuous canal, so it can be difficult to negotiate even with hand file (4). From clinical point of view, MB2 canal could be difficult not only to detect but also to instrument which has been confirmed by Seidberg *et al.* and Slowey *et al.* (5-6). Moreover, Imura *et al.* (1) showed that in the extracted maxillary first molars, although the orifice of the MB2 was located, but it was almost impossible to clean and shape it thoroughly. So, negotiation and instrumentation of the MB2 canal is still one of the prevalent problems in root canal therapy.

However, the outbreak of NiTi rotary files has led to improve cleansing and shaping efficacy parallel with saving time in difficult canals. Yet, it has been confirmed in the studies that rotary driven files cannot negotiate the canals to the apical foramen unless a “glide path” is established first to the working length using a hand file, typically #10 or #15 file (7).

But, most of NiTi rotary files are performed based on the crown-down technique which start with the largest file and continue with the next smaller one to go deeper, until the apex is reached. And, none of these rotary systems include such small sized files which can be use for negotiation. In contrast, Mtwo system is an exception which involves the practitioner begins with the first file to full working length. Also, Mtwo is the only system with such small sized files like 10/.04 and 15/.05 which are used at the beginning of the preparation to reach the apical third.

The Mtwo has been shown that keeps the root canal anatomy unchanged (8), less file breakage and fracture, running prominently faster, removes debris significantly better comparing to other systems (9-10).

According to the special design of Mtwo system and the difficulty of MB2 canal negotiation, the aim of this clinical study is to compare the capability of initial penetration between NiTi Mtwo system and K hand files in MB2 canal of maxillary first molars.

### Materials and Methods

Among the referred patients to Shahed Dental School, 57 patients who required conventional root canal therapy of maxillary first molar, between 16 to 60 years old, without any previous treatment and periapical lesion and serious systemic diseases were involved for this study. Informed consent was obtained and a clinical exam was administered. Initial periapical radiography was done by parallel technique and XCP device for estimating the working length of MB root. Local anesthetic was administered and endodontic access was achieved under rubber dam isolation. MB1 and MB2 orifices were explored with Dj-16 explorer, so only in 32 cases

the MB2 were found. First, before penetrating into the MB1, we negotiated the MB2 canal.

Attempts were made to negotiate the MB2 with K hand file #10 (Mani Co, Tokyo, Japan). If K-file #10 could go to estimated working length thoroughly, the tooth was excluded from the study. Thus we lost 2 cases. Otherwise, if K-file #10 could not go more than 2mm into canal passively, #8 K-file was used for more penetration. Still, without anymore penetration of #8 K-file, we used #6 K-file respectively to achieve negotiation of the MB2.

Meanwhile, if K-file #6 could not go more than 2mm into canal passively, the tooth was removed from the study. But we didn't loss any of the cases in this stage.

Therefore, with respect to depth of penetration, samples were divided into three groups:

Group A: K-file #10 could penetrate more than 2mm of the coronal third of the MB2 (but not all length of canal).

Group B: K-file #10 could penetrate MB2 canal passively less than 2mm, so we continued K-file #8 for going deeper penetration.

Group C: K-files #10 and 8 could not penetrate more than 2mm of the MB2, then K file #6 was applied.

Mtwo file #10 (VDW, Munich, Germany) was applied to three above groups by an electric device, ENDO IT (VDW, Munich, Germany). Mtwo format was set and headpiece with a 4:1 reduction of speed was used at 250rpm with brushing movement until resistance was felt. Lubricating of MB2 canal was made with filecare (VDW, Munich, Germany). The penetration depth of M two file #10 in all samples was set as Group D.

The precise working length of MB2 canals was determined with K- file #10 radiographically by parallel technique and XCP device.

Data was submitted to statistical analysis using Duncan test by SAS software (version 9.1) in GLM procedure.

### Results

Table 1 shows the mean penetration depth of each group. Analysis of data showed no statistical significant difference between groups A, B and

**Table 1: Mean penetration depth of rotary and hand files**

Treatment groups	n	mean depth of penetration
Group A (#10 K-file)	5	11.00 ± 0.92 <sup>b</sup>
Group B (#8 K-file)	11	10.00 ± 0.68 <sup>b</sup>
Group C (#6 K-file)	14	8.87 ± 0.51 <sup>b</sup>
Group D (#10 Mtwo file)	30	19.16 ± 0.35 <sup>a</sup>

Means within columns followed by the same letter are not significantly different by Duncan test

C. But group D has significant difference with all these three groups ( $p < 0.01$ ). As the Figure 1 shows, the rotary instrument has significant more penetration depth comparing to K-file instruments.

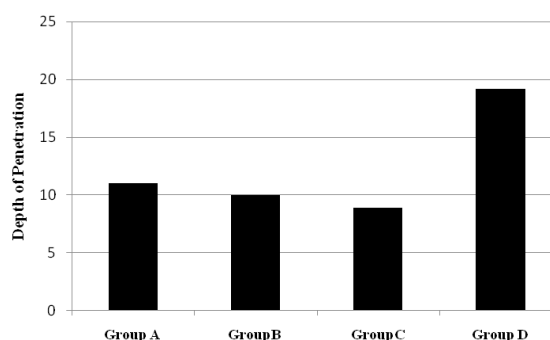
### Discussion

The objective of negotiation is to create a glide path to and beyond the terminus, remove the pulp from the primary canal, to determine length ( $\pm 0.5$ mm of accuracy), and to cut #15 file or larger to length, prior to rotary instrument (11). Negotiation is one of the most difficult and artful aspects of root canal therapy. Buchanan believed that you may be lucky to get to working length in all canals in the first two-hour appointment when you treat a molar tooth (11).

In most studies #6, #8 or #10 K hand files are used for initial negotiation in different canals (12-13). We also used these files, but in none of the cases k hand file can reach to the full length of the MB2 at negotiation step.

Although, NiTi instruments have solved many of endodontic problems, but many studies believe that these instruments are for canal enlargement not for canal negotiation (7).

According to the objective of negotiation which is penetrating to working length of canal, and considering that negotiation of small canals need a very small tip sized file, we selected #10 M two rotary file in this study because of two important features. First of all, it is the only rotary instrument with small size (10/.04). Secondly, Mtwo system is the exclusive rotary system which practitioner begins the treatment with the first file to full working length and canal will be prepared at coronal and apical simultaneously.



**Figure 1: Comparative mean depth of penetration for the experimental groups**

Before negotiating of MB1 we entered the MB2 canal, because the canals might have the Wiene's class II configuration, so entering to MB1 would simultaneously make a guide path in MB2.

Our results revealed that #10 Mtwo file could negotiate almost the full length of MB2 in all the cases. This is conflicted with other studies. In this study we had one file fracture, no ledge or transportation, although we used each Mtwo file one time for each canal. The broken file was bypassed easily. However, Schafer *et al.* and Veltri *et al.* had no Mtwo fractures during curved root canal preparation (9-10, 14-15). Hard condition of root canal therapy in clinic and dissimilarities of clinical and laboratories study are the most likely causes of fracture in our study.

In our clinical study #10 M two file advanced progressively in the canal without applied any pressure. Withdrawn brushing movement was used for penetration until a resistance was felt. In most cases we did not felt any resistance until the #10 M two reached to the estimated working length of canal.

This ability of #10 Mtwo in negotiation of the MB2 is maybe because of its high cutting ability (16), non cutting tip and increasing distance between the blades from the tip of file towards the shaft which indicate safety of use and progression towards the apical area safely whilst working more efficiently in the coronal third.

Also, the backs of the cutting edges are sharp to optimize cutting efficacy and facilitate advancement of the instrument in the canal. Mtwo file #10/.04 application needs more skill

(especially brushing movement), hands-on training, less applied pressure comparing with other rotary files.

### Conclusion

This clinical study provides some data to support further research into the use of rotary systems in negotiations of canals.

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