A Study on The Shape of a Canal Prepared With ‘TWO-FILE’ Technique

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ABSTRACT

‘Two-File’ 방식에 의한 근관 형성시 근관의 형태에 관한 연구
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성균관대학교 의과대학 치과의과학과, 서울대학교 치과대학 보존학교실*

이 연구의 목적은 ‘Two File’ 방식에 의한 근관 형성시 근관의 형태변화 및 전이경도를 분석하고 이를 기존의 근관형 성형법과 비교하고자 하는 것이다. 분석된 근관을 가진 후방면 음성분극상에서 step back방식, crown down방식 및 ‘Two File’ 방식으로 근관형성을 시행하고 이를 통해 위치가 재현가능한 고정물에 위치시킨 후 사전의 이중노출 기법을 이용하여 근관형성 전후의 근관의 형태변화 및 전이경도를 분석한 결과 다음과 같은 결과를 얻었다.

1. step back방식의 경우 형성된 근관이 taper하지 못하고 불규칙한 형태를 보였으며 근관의 전이경도도 다른 두 가지 방법과 동일한 경우에 의해 유의하게 적었다 (p < 0.05).
2. crown down방식의 경우 형성된 근관이 taper한 형태를 보였고, 근관의 전이경도도 step back방식에 의한 경우보다 유의하게 적었다 (p < 0.05).
3. ‘Two File’ 방식의 경우 형성된 근관이 taper한 형태를 보였으며 근관의 전이경도도 step back방식에 의한 경우보다 유의하게 적었으나 crown down방식에 의한 경우와 유의할 만한 차이는 없었다 (p < 0.05).

주요어: 근관형성, 형태, 전이, ‘Two File’ 방식, 이중노출 기법

I. INTRODUCTION

Cleaning and shaping of root canals are important phases in endodontic therapy. Instrumentation objectives include defining the root canal system, continuously tapering in a conical form, and maintaining the original shape and position of the apical foramen. However, ledge formation, transportation of the apical foramen, and nontapered hourglass shaped preparation are problems frequently observed after the instrumentation on curved root canals.

A number of preparation techniques and instruments have been studied with the aim of providing an optimum shape at the end of the preparation. This has resulted in improvements in the file tip design, changes in the cutting surface, and changes in the materials of which the instruments are made. One of the most endodontic significant advances that may alleviate the problem of straightening curved canals is the nickel titanium file.

Root canals can be prepared manually or with the aid of a mechanical device. Preparing the root canals manually is highly technique sensitive and labor intensive. This has led to the introduction of various engine driven instruments. New products and instruments may enhance endodontic treatment with respect to both its quality and its speed.

Many of the new nickel titanium instruments have increased taper in the hope that the greater flare along the active element of the instrument shaft will create automatically the flare required in the canal shape. And a technique which uses as few files as possible is preferred because exchanging a file to another file is a tedious procedure. We developed
Two Files’ technique, in which we use only two nick
titanium files to carry out most of canal prepara
tion procedures.

The aim of this study was to assess the ability of a
new 'Two File’ technique to shape simulated curved
canals in clear resin blocks.

II. MATERIALS and METHODS

Thirty six clear casting resin blocks (Densply
Mailfer, Ballaigues, Switzerland) containing simu-
lated root canals with apical and coronal diameters of
0.15mm and 0.35mm (±0.02mm), respectively, were
used for this study.

The blocks were divided into 3 groups of 12: Group
1 was instrumented with K Flexofiles (Densply
Mailfer). Group 2 and Group 3 were instrumented
with ProFiles of 6% taper and ISO sized tips
(Densply Mailfer). The working length (WL) was
established with an ISO size 10 instrument.

Group 1

Group 1 was instrumented with K Flexofiles by
means of the step back technique. An ISO size 15 K
Flexofile was placed to the length of the canal by
means of a filing and a reciprocal reaming (watch
winding) action until the file fit loosely in the canal.
This was repeated with successively larger files until
an ISO size 25 file reached the WL. Successively
larger files were inserted at 0.5 to 1.0mm steps short
of each other until the midcanal area was instru-
mented to an ISO size 60 file. Patency was verified
after each file size by introducing an ISO size 10 file
to the WL. Copious irrigation with water ensured
that the canal was free of resin debris.

Group 2

Group 2 was instrumented in a crown down man-
ner at a constant rpm of 250 as recommended by the
manufacturer with the ProFile 6% taper instruments
with apical sizes corresponding to ISO sizes 15, 20,
25, and 30°. A size 25 ProFile was introduced one
half to two thirds of the way down the canal. The
instrument was withdrawn when resistance was felt
and was followed by a size 30 ProFile to approxi-
mately the same length. A size 20 ProFile was then
used two thirds to three quarters of the way down
the canal, and then a size 15 ProFile was used to the

![Fig. 1. Double exposure images of root canal space before and after preparation. Red portion represents unprepared canal space and pink portion represents prepared canal space. A, step back technique (group 1). B, crown down technique (group 2). C, 'Two File’ technique (group 3)]](image-url)
II. RESULTS

Change in Total Canal Width

Profiles in group 2 and 3 caused a taper widening in total canal width (Fig 1). But the K Flexofiles caused greater, non-tapered widening of canal space than did the Profiles, significantly wider change (0.47–0.62mm) at apical 1mm to 3mm (p < 0.05), and the widest change (0.75–0.77mm) at apical 4 mm to 5 mm.

Change in Outer Canal Width

Profiles in group 2 and 3 caused a taper widening of the canal space to the outer side of the curvature, which is the finest at the apical side, and wider at the coronal side (Fig 1). The outer shape of the canal prepared by Profiles resembled a graceful curve. But the K Flexofiles caused a rather severe widening (0.32–0.34mm) at apical 1mm to 4mm, and maximum widening (0.34mm) at apical 2mm to the outer side of the curvature (Table 1). The outer curvature of the canal prepared with K Flexofiles was irregular.

Change in Inner Canal Width

Profiles in group 2 and 3 caused a taper widening of the canal space to the inner side of the curvature (Fig 1). K Flexofiles caused great and non-tapered widening of canal space to the inner side of the curvature. It caused significantly greater widening (0.42–0.50mm) than did the Profiles at apical 4mm to 5 mm (p < 0.05) and maximum widening (0.52mm) at the apical 6 mm.

Amount of Transportation From the Original Axis

Profiles in group 2 and 3 transported the canal slightly away from the original axis (0.05–0.12mm) to the outer side of the curvature at the apical part, but the amount was insignificant (Table 1). K Flexofiles transported the canal to the outer side of the curvature at the apical part, maximally (0.17 mm) at the apical 1 mm. They greatly transported...
Table 1. Mean values of total, outer, inner, canal width, and amount of transportation (in millimeters with SD in parentheses).

<table>
<thead>
<tr>
<th>Distance from apex</th>
<th>1mm</th>
<th>2mm</th>
<th>3mm</th>
<th>4mm</th>
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<th>7mm</th>
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<td>Total canal width</td>
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<td>0.55</td>
<td>0.62</td>
<td>0.75</td>
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<td>Outer canal width</td>
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<td>-0.23</td>
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</tbody>
</table>

Minus value indicates that original axis of canal was transported to inner side of curvature after canal preparation.

The canal to the inner side of the curvature at the coronal part, maximally (± 0.32 mm) at the apical 6 mm.

IV. DISCUSSION

The use of clear casting resin blocks appears to be not only valid substitution for root canals in natural teeth, but of great help in improving our understanding of the behaviour of endodontic instruments in root canals. The double exposure method provided enlarged images of root canals, which could be elucidated and accurately quantified. The method provided a clear view of the areas that were enlarged or remained unchanged after instrumentation.

From this study, it was found that ProFile in a crown down manner and "Two File" technique caused taper widening of canal space to the inner side of the curvature. Taper but somewhat more widening at apical 4mm to 5mm to the outer side of the curvature, and taper widening in total canal width. The inner and outer outline of the curved canal was a smooth curve. The original axis of the curved canal was transported somewhat to the outer side of the curvature at the apical area, but the amount was not great.

K Flexiform caused taper effect but somewhat more widening at apical 5mm to 6mm to the inner side of...
the curvature. It caused more widening at the apical area than at the coronal area and maximum widening at the apical 2mm to the outer side of the curvature. It created a nontapered shape with respect to the total canal width and greater widening than ProFiles; the maximum widening was observed at the apical 4mm to 5mm. The inner and outer outline of the prepared canal was not a smooth curve. The original axis of a curved canal was transported to the outer side of the curvature at the apical area and greatly to the inner side of the curvature at the coronal area.

Kavanagh and Lumley and Bryant et al. found that the use of ProFile instruments was effective and produced good canal shapes. Other studies partly supported their observations. The results of the present study were consistent and support these previous findings in that ProFile instruments used in a rotary fashion performed significantly better than the hand instruments. In this study ProFiles in ‘Two File’ technique also showed results as good as ProFiles in a crown down manner.

Further research is needed to evaluate the physical properties of nickel titanium instruments to determine whether they can be safely used in a rotary fashion.

V. CONCLUSION

The purpose of this study was to evaluate the ability of a new ‘Two File’ technique to shape simulated curved canals in clear resin blocks. A total of 36 simulated curved canals on resin blocks were instrumented by means of the step back technique, crown down technique, and ‘Two File’ technique. With the mounting device, which can reproduce the same position of the resin blocks and the camera, the unprepared and prepared canals were accurately compared by means of a double exposure photographic technique. The analysis of variance test was used for the statistical analysis of data obtained.

The results were as follows:

1. The canals prepared with the K Flexofiles showed nontapered widening and significantly greater transport than those prepared with the step back technique (p < 0.05).

2. The canals prepared by means of crown down technique showed taper widening and significantly lesser transport than those prepared with K Flexofiles (p < 0.05).

3. The canals prepared by means of ‘Two File’ technique showed taper widening and significantly lesser transport than those prepared with K Flexofiles (p < 0.05). There were no significant differences between the two results by the two engine driven techniques (p < 0.05).

REFERENCES