

## REVIEW ARTICLE

## MANAGEMENT OF CURVED ROOT CANALS: A CASE REPORT

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## ABSTRACT

*A tooth with a straight root and a straight root canal is an exception rather than being normal because most teeth show some curvature of the canal. In addition, most canals have multiple planes of curvature throughout their length.<sup>1</sup> Tomes, in 1848, called such curvatures as "dilacerations." It refers to an angulation or a sharp bend or a curve in the root or crown of formed tooth or a deviation or bend in the linear relationship of a crown of a tooth to its root.<sup>2</sup> Dilaceration is the result of a developmental anomaly in which there has been an abrupt change in the axial inclination between the crown and the root of a tooth. Dilaceration can be seen in both the permanent and deciduous dentitions, and is more commonly found in posterior teeth and in maxilla.*

**Keywords:** Curved canals, flexi files, canal preparation.

## INTRODUCTION

One of the most important aspects of endodontic treatment is the cleaning and shaping of the root canals. The most desirable shape of the prepared canal is a progressive taper with the largest diameter at the coronal end and is narrowest at the apical constriction.<sup>3</sup> A progressive taper allows a greater degree of instrument and irrigant contact with the surfaces of the canal walls, thereby enhancing the effectiveness of cleaning.<sup>4</sup> However, the preparation of curved canals presents one of the greatest challenges in endodontics and is fraught with difficulties. Only the curvatures in mesio-distal plane can be seen on radiograph, though curvatures in the bucco-lingual plane are also evident in many teeth. Failure of root canal treatment in curved canals is mainly due to procedural errors like ledges, fractured instruments, canal blockage, zip and elbow creation.<sup>5</sup> How to determine Curvature of the canal?

Before initiation of the treatment, an estimate of the curvature should be made on the radiograph. The interior angle is formed by the straight line from the orifice through coronal portion of the root and another straight

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line form the apex through the apical portion of the root. Various techniques used for management Traditionally, canal shaping has been achieved using ISO- normed, 0.02-tapered stainless steel instruments. Sizes above #15 or #20 become inflexible and have a tendency to straighten. When carried out in curved canals, such procedure often results in iatrogenic damage to the natural shape of the canal, particularly in its apical third, resulting in errors like ledge, elbow or zipping of the canal.<sup>5</sup> To avoid occurrence of such errors, even contact of the file to canal dentine should be there. But the file has the tendency to straighten up, and hence it is difficult to control removal of dentine along the entire length of file in push pull motion. The above errors can be reduced by<sup>6</sup> 1) Decreasing the restoring force by means of which straight file apt to bend against the curved dentine surface and 2) Decreasing the length of the file which is aggressively cutting at a given span. Decreasing the force can be done by the following.

## PRECURVING THE FILE

A precurved file traverses the curve better than a straight file. Precurving is done in two ways:

- Placing a gradual curve for the entire length of the file
- Placing a sharp curve of nearly 45° near the apical end of the instrument

Extravagant use of smaller number files as they can follow canal curvature Because of their flexibility, they should be used until larger files are able to negotiate the canal without force.

Use of intermediate size of files It allows smoother transition of the instrument sizes to cause smoother cutting in curved canals, e.g. cutting 1 mm of No. 15 file makes it No. 17 file as there is an increase of 0.02 mm of diameter per millimeter of length.

## USE OF FLEXIBLE FILES

As they help in maintaining shape of the curve and avoid errors like ledge, elbow or zipping of the canal.

Decrease in length of actively cutting files is achieved by the following:

- o Anti-curvature filing.

- o Modifying cutting edges of the instrument by dulling the flute on outer surface of apical third and inner portion of middle third, which can be done by diamond file
- o Changing canal preparation techniques, i.e. use of crown down technique. Tendency to create narrow canal shapes minimizing access of irrigants and
- o Creating potential allow debris to be pushed apically. Attempts at overcoming the deficiencies of these instruments resulted in a number of preparation techniques that aimed to reduce iatrogenic defects and produce canals with amore flared shape.<sup>5</sup>
- A significant advancement in root canal preparation with hand instruments was made with the introduction of balanced force movements of files. The balanced force movements of the file are:<sup>5</sup>
- Clockwise 60°, so that it binds against the wall and advances apically.
- Anticlockwise 120° with apical pressure, so as to crush and break off the engaged dentinal wall.
- Clockwise 60° without apical advancement, allows flutes to be loaded with debris and removed from the canal.

#### ADVANTAGE

- Efficient and less prone to cause iatrogenic damage and maintains the instruments centrally within the root canal.
- Extrusion of debris apically is also reduced, resulting in less postoperative pain.

#### MOTION OF FILE IN A ROOT CANAL

Enlargement of a straight canal does not pose particular problems. It could be done by a succession of inward and outward motions accompanied or not by rotary motions. However, curved canals are different where departure from the balance d force technique can result in damage of the canal wall. As it is impossible to ascertain on the basis of radiograph whether there is a curvature in a buccolingual plane or not, it is expedient to apply the balanced force techniques as a general rule for the preparation of all root canals.<sup>7</sup>

- Introduction of very flexible instruments made from nickel titanium alloy having a taper 2-6 times greater than the ISO standardized 0.02 files have revolutionarised the management of curved canal. They have the ability to pass around curves more readily. They are available as GT instruments and Protaper instruments (Dentsply). Both instruments appear to offer many advantages over traditional

0.02 taper hand instruments. Both instruments can be used in conjunction with or complementary to rotary instruments. Hand NiTi instruments can also be selected instead of rotary instruments in teeth with difficult canal anatomy like severe curvature in apical third and problematic handpiece access.<sup>5</sup>

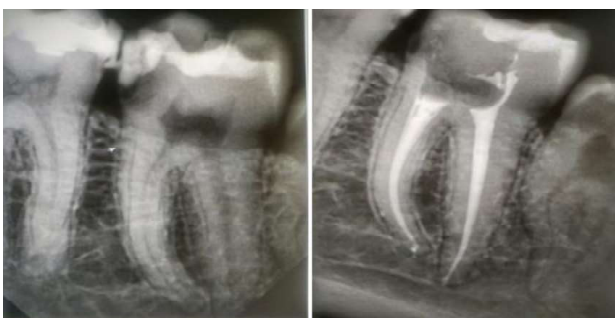
- The crown-down sequence of instrumentation has largely superseded the outdated step-back method. The advantages of this root canal preparation from crown to apex with early coronal flaring include<sup>5</sup>:
- reduced coronal binding of instruments;
- less likelihood for a change in the working length measurement during preparation;
- less risk of inoculation of endodontic pathogens into the peri-radicular tissues.
- Enhanced penetration of irrigant into the root canal system

#### SEQUENCE OF INSTRUMENTATION DONE WITH VARIOUS TYPES OF CURVATURES

1. Endodontic therapy was initiated under local anesthesia and straight-line access was gained in all the three canals.
2. Pulp chamber was irrigated with sodium hypochlorite (NaOCl). Initial scouting of all the root canals was done with K-file no. 10, one by one, and the patency of root canals was established. This negotiating file reproduced the same curvature as that of the curved root canal.
3. File no. 10 was clipped by 1 mm and precurved in the same direction and to the same extent as the scouting file this gave us file no. 12.
4. File no. 12 so obtained was placed in the canal till the apical third.
5. Special emphasis was placed on frequent irrigation of the root canal to avoid blockage by dentinal debris and to remove the necrotic tissue. NaOCl and saline were used for irrigation.
6. Simultaneously, reverse flaring was initiated in the coronal third with K-file no. 40. It was placed in the orifice position for a slight reaming of the coronal portion.
7. Recapitulation was done with file no. 12 and coronal flaring was done in crowndown fashion with K-files no. 35 and 30.
8. Gate-glidden (GG) drills were placed sequentially in a step-back fashion (i.e. no. 1, 2 and 3) to allow easy placement of instruments and to improve the

tactile sensation of the instrument placed in the canal. Coronal flaring till (GG) no. 3 was sufficient to provide unrestricted placement of the instrument.

9. Recapitulation with file no. 12 was done to check patency and to remove the dentinal debris thus created.
10. File no. 12 was placed and the pulp chamber was flooded with ethylenediaminetetraacetic acid (EDTA) that provided the necessary lubricating action.
11. A working-length radiograph was taken at this point with file no. 10 placed in the root canal to avoid overinstrumentation.
12. Sequential filing of the curved canal was done with K-files no. 15, 20, and 25 until full working length was achieved. Files were selected to take advantage of the flexibility of the files up to no. 25.
13. K-File no. 30 was placed 1 mm short of the working length.
14. To confirm the deep shape and completeness of uniform preparation, files no. 30, 35, 40 and 45, etc. were used passively in step-back fashion until 3–4 mm short of the orifice.
15. During the whole preparation, root canals were repeatedly irrigated with irrigant and frequent recapitulation was done.
16. A final working-length radiograph was taken, Canals were flushed with saline and dried with paper points.
17. All the straight canals were conventionally prepared



**Fig. 1: Case 1 Mandibular molar**



**Fig. 2: Maxillary Molar**

by using the stepback preparation technique. The lateral condensation method of obturation was preferred.

## DISCUSSION

One of the most important aspects of endodontic treatment is the cleaning and shaping of the root canals. The most desirable shape of the prepared canal is a progressive taper with the largest diameter at the coronal end and is narrowest at the apical constriction. A progressive taper allows a greater degree of instrument and irrigant contact with the surfaces of the canal walls, thereby enhancing the effectiveness of cleaning. However, the preparation of curved canals presents one of the greatest challenges in endodontics and is fraught with difficulties. Only the curvatures in mesio-distal plane can be seen on radiograph, though curvatures in the buccolingual plane are also evident in many teeth. Failure of root canal treatment in curved canals is mainly due to procedural errors like ledges, fractured instruments, canal blockage, zip and elbow creation. The cases presented above were treated with hand instrumentation with K files and NiTi rotary instruments. It is important that a tooth with complex root canal morphology be treated properly the very first time, since endodontic treatment in such teeth is likely to fail if not treated carefully.

## CONCLUSION

Proper care and attention should be directed in radiographic assessment, access cavity preparation and exploration to negotiate extra and curved canals. Current NiTi preparations that use files with greater taper or variable taper are a substantial improvement over instrumentation with 0.02 tapered stainless steel files, particularly when used in curved root canals. These newer instruments produce better shape, using fewer instruments and in a shorter time.

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