

# CURVED CANAL MANAGEMENT - A CASE REPORT

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## ABSTRACT

**Aim-** To report hybrid instrumentation method in double-curved mandibular premolar.

A 48-year-old male reported to the Department of Conservative dentistry and Endodontics of Dr. R. Ahmed Dental College and Hospital with pain in relation to 35. The root of 35 were doubly curved. The first attempt to negotiate was hindered at the level of the first sharp curvature. The distance from the coronal reference point to this point was determined as the coronal zone. Initial coronal debridement was done with a rotary Protaper S1 file in conjunction with stainless steel hand files to remove pulpal tissues. Once the desired coronal length was reached apical curvature was prepared by Hyflex CM up to 25/04. Patency was maintained throughout the procedure. Chemical disinfection and smear layer removal was done using positive syringe irrigation with 5.25% NaOCl solution and 17% EDTA solution, delivered through a 30-Gauge needle. With a corresponding size gutta percha point the canal was obturated.

## KEY WORDS

**Zone Technique, Curved Canal, Rotary Files.**

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## INTRODUCTION

Endodontists deal with various curved root canals on a regular basis. To manage these canal systems, the endodontist should approach with knowledge of the various anatomic challenges and experience of both contemporary and traditional instruments. The goal of quality endodontic therapy has remained the same since its inception. Appropriate removal of pulpal tissues with proper cleaning and shaping followed by an obturation system and coronal seal will satisfy both mechanical and biological objectives.<sup>1</sup> Failing to realize canal curvature before treatment can lead to preparation errors (i.e., apical zips, perforations, canal blockages, or instrument separation), which can leave the canal unprepared and lead to continued periapical pathology compromising the outcome of treatment.<sup>2</sup> Endodontic treatment of severely curved canal definitely depends on reframing treatment strategy for success.

## STRATEGY TO SUCCESS

The fact that roots are curved was initially appreciated by simply stating the angle of the curve<sup>3</sup> and then categorising roots as straight (5° and less), moderately curved (10 to 20°) or severely curved (20°). However, it has been pointed out that the radius of the curve has to be viewed together with its angle.<sup>4</sup>

Most root canals are curved, but endodontic instruments are manufactured from straight metal blanks and these result in uneven force distribution in certain contact areas<sup>5,6</sup> and a tendency of the instrument to straighten itself inside the root canal.<sup>7</sup>

The above errors can be reduced by decreasing the restoring force and length of the cutting span of file. Decreasing the force can be done by pre curving the file, 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, use of smaller number files (as they can follow canal curvature because of their flexibility), use of intermediate size of files and use of flexible files and decrease in length of actively cutting files is achieved by anti-

curvature filing, modifying cutting tip and changing canal preparation techniques, i.e. use of crown down technique<sup>6</sup>.

## NECESSARY INSTRUMENT

For initial scouting it is important to use stain less steel hand files that can be pre curved to follow the abrupt curvature .To achieve larger preparation Niti instrument must be considered. Larger stainless steel instruments can alter the internal structure of the canal (i.e., increased canal transportation) when compared to nickel titanium instruments.<sup>7</sup>

Conventional super elastic Niti alloys are safer than stainless steel. Niti alloy have a lower modulus of elasticity (one fourth to one fifth of stainless steel).These alloy also show shape memory and super elasticity<sup>8</sup>.

File fracture remains always concern for curved canal instrumentation. It is well established that two type of fracture is seen in endodontic file. Torsional fracture occurs when an instrument tip is locked in a curved canal while the shank continues to rotate. Flexural fracture occurs after repeated sub-threshold load.

Recent days a new file system came into the market that is CM (controlled memory) files. Contrary to super elastic (SE) Niti wire, files made with CM wire were found to be extremely flexible, fatigue resistant and without the tendency to restore themselves to their original linear shape<sup>9,10</sup>. Therefore without restoring force (no tendency to rebound after removal of load) these files are found to be able to rotate around an abrupt curvature with minimum canal transportation<sup>9</sup>.All these properties are suitable to be used in curved canal instrument.

## CORRECT PROCEDURE

The **Zone technique** was designed with two objectives for minimising stress on any type of Niti rotary file: One, the canal diameter should be large enough coronal to a curvature to prevent any engagement in that portion of the canal when any file is being used apical to the curvature. Two, the file diameter should be small enough to rotate safely in a curvature. The canal portion short of the resistance defines the coronal zone and the portion beyond the resistance defines the apical zone<sup>11</sup>.

The aim of this case report is to present the clinical and radiographic outcome of the root canal treatment of a severely curved mandibular premolar using a novel instrumentation technique.

## CASE REPORT

A 48-year-old male reported to the Department of Conservative Dentistry and Endodontics, with pain in relation to lower right posterior teeth. On clinical examination tooth no 35 was found to be extremely tender on percussion but there was no carious involvement. Thermal tests confirmed diagnosis of irreversible pulpitis for 35. IOPA x ray revealed pronounced curve in the root of 35.The root of 35 were doubly curved (Bayonet or 'S' shaped). After inferior alveolar nerve block anaesthesia with 1.8 mL of 2% Lignocaine (with 1: 100.000epinephrine) rubber dam isolation was done. The first attempt to negotiate the apical third of the curved root with a size 06 K-file (Mani Inc., Utsunomiya, Tochigi, Japan) was hindered at the level of the first sharp curvature. The distance from the coronal reference point to this point was determined as the coronal zone. (Figure 1A).



Figure 1- 1a-Negotiation with small no k file

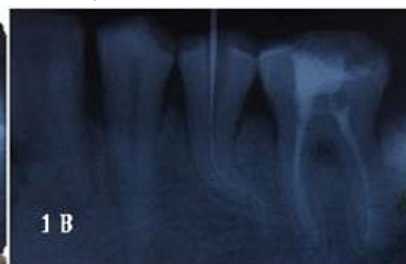


Figure 1b-Yellow line demonstrate Coronal Zone and Red line demonstrate apical zone



Figure 2- 2a-Check GP radiograph Figure 2b-after obturation radiograph

A watch-winding motion was employed to negotiate the canal. In this case report, a manual glide path was created to a size 10 K-file (Mani Inc.) (Fig. 1B). Working length was measured by Root ZX mini (Morita). Initial coronal debridement was done with a rotary Protaper S1 file (Dentsply Tulsa Dental Specialties) in conjunction with stainless steel hand files to remove pulpal tissues. The canal was irrigated and patency was maintained with a pre-bent size 10 K-file. For coronal zone S1 file was used. Once the desired coronal length (up to the first abrupt curvature) was reached, apical curvature was prepared by Hyflex CM up to 25/04. Patency was checked throughout the procedure with no 10 k file.

During instrumentation if the file stopped moving apically then the instrument was withdrawn, irrigation and recapitulation done with a hand file. Chemical disinfection was done using positive syringe irrigation with 5.25% NaOCl and 17% EDTA solution delivered through a 30-Gauge needle. The canal was dried by absorbent points and with a corresponding size 25/04 master gutta percha point (coated with sealer) the canal was obturated (Figure 2). The floor of the chamber was sealed with glass ionomer cement (Fuji GC Corporation).

## DISCUSSION

The proper knowledge of root canal anatomy is a prerequisite for preparing curved root canals. For initial scouting it is important to use stainless steel hand files. These files can be pre curved to follow the abrupt root canal curvature. In the present case, a watch-winding motion was used until a glide path of size 10/02 taper was prepared. To achieve larger preparations Niti files should be used. Historically various instrumentation techniques had been proposed for curved canal preparation like Step back technique, Crown Down technique, Anti Curvature File technique etc. Regardless, a Crown Down approach is superior to step back in decreasing fracture risk by preventing a large portion of an instrument from engaging root dentine.<sup>12</sup>

However in this case report modified Crown Down approach was used. This approach aims to minimise file engagement. The canal diameter should be large enough coronal to curvature (coronal zone) to prevent any premature engagement. Niti instruments are available along a large spectrum that spans austenitic (A) phase rotary files to a martensitic (M) phase instrument. These 2 forms represent 2 crystalline structures of the same nickel titanium metal, each with different characteristics. Traditional Niti files are in the A phase and are referred to as shape memory files. Recently, files have been introduced that are heat treated to change their crystalline phase, and these files are referred to as controlled memory files. In general, A-files are more resistant to torque and less resistant to cyclic fatigue, while M-files are just the opposite. Also, A-files will be stiffer and sharper than M-files of similar size and

shape.

So, A and M rotary files are best used in different circumstances: A-files will serve best when we want to treat (basic to moderately curved cases), while M files will rise to their best advantage when treating severely curved canals.<sup>13</sup> Keeping in mind these observations for coronal zone preparation (up to first abrupt curvature) Protaper S1 file was used and for apical abrupt curvature CM files were used.

In highly curved canals, the ability of irrigant solutions to be delivered to the critical apical third depends directly on the ability of the instruments to create adequate apical preparations and on the selection of the appropriate delivery techniques<sup>14</sup>. In this case report a 30 gauge side vented needle was used for irrigation. With a corresponding size (25/04) master gutta percha point (coated with sealer) the canal was obturated. The floor of the chamber was sealed with glass ionomer cement (Fuji GC Corporation) and post endodontic restoration done.

The present case report provides a novel approach for dealing with severely curved root canals. However it may be approached using alternative method and instruments.

## CONCLUSION

It is important for the Endodontist to assess each tooth and realise which instruments or techniques give the best chance to ascertain the predictable outcome.

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