

An Endodontic Management of Severely Curved Root Canals by Using Controlled Memory Files: A Case Series Report

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ABSTRACT

Background: Negotiating and shaping the Severely curved root canals often present a challenging situation in their Endodontic treatment. An insight of canal anatomy, coronal preflaring, precurving of all the hand instruments and use of controlled memory files and new instrumentation techniques facilitates easy negotiation of canal curvature and maintenance of the shape without any procedural mishaps. The controlled regularly tapered preparation of the curved canals is the ultimate challenge in endodontics. Careful and meticulous technique will yield a safe and sufficient enlargement of the curved canals. This case series presents two such interesting cases of endodontic management of curved canals by using controlled memory files.

Keywords: Curved canal, Controlled memory files, Procedural mishaps.

INTRODUCTION

A tooth with a straight root canal is an exception rather than being normal because most teeth show some curvature of the canal. Most canals have multiple planes of curvature throughout their length. (1)Tomes, in 1848, called such curvatures as Dilacerations. (2) The success of root canal therapy in severely curved root canals may be influenced by many factors such as flexibility and diameter of endodontic instruments, instrumentation techniques, location of foraminal opening and hardness of dentin.(3)

Traditional methods of canal shaping are Stainless steel hand files and conventional nickel titanium hand or engine driven files. As stiffness of stainless steel files increases as we increases its diameter, they are not used in curved canals because they straighten and may cause iotrogenic damage to root canals if they are used in curved canals.(4) Conventional NiTi have advantages like low modulus of elasticity, greater strength, more resilient, shape memory and super elasticity but they often not serve well for complicated cases such

as those with severely curved canals due to inherent memory. Procedural errors may seen in severely curved canals when we use conventional Ni Ti are canal transportation, ledge formation, instrument separation, blockage of canal, zipping and elbow creation.(5,6)

In 2011, Controlled memory files were introduced in endodontics. They are manufactured by utilising a thermomechanical processing that controls the material's memory. These files are extremely flexible, fatigue resistant with accelerated flute design. They exhibited in martensite phase. They have no shape memory and lack of restoring force of conventional NiTi files . (7)

These files are ideal to use for instrumentation of highly curved and complicated canals. The controlled memory effect helps the file to retain the shape of the canal even when it is out of the canal. They do not show spring back action like conventional NiTi and avoids procedural errors in curved canals. These files showed warning sign before fracture and regeneration by heat treatment. This system has double fluted cross section with

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uniform taper of 4%, 6% and 8%. (8) Examples of controlled memory files are Hyflex CM, Typhoon CM, MANI SILK, ProFile Vortex Blue .

CASE REPORTS

Case 1

A 35 year old male patient reported to the outpatient Department of conservative dentistry and Endodontics with the chief complaint of pain in lower right back region of jaw.

Clinical examination revealed deep mesial caries with mandibular right third molar . The tooth was tender on percussion. Medical history was noncontributory. Toot was vital when pulp sensibility tests (electric pulp test and heat test) were conducted. The radiographic examination revealed the radiolucency involving mesial pulp horn and periodontal ligament widening. Apart from these findings, a sharp curvature in the mid-third region of the tooth was observed on the radiograph [Figure 1a]. Angle of curvature of root canal was measured by Schneider's method .A diagnosis of chronic irreversible pulpitis was established and the endodontic treatment was planned followed by full coverage restoration of the tooth.

With informed consent, local anesthesia was administered using 2% lignocaine and 1:200,000 Adrenaline and Endodontic therapy was initiated under rubber dam isolation. Caries was removed and the endodontic access cavity was prepared using Endo access bur # 2 (Dentsply Maillefer). All canal orifices are preflared with GG drills size 3. Working length radiograph was taken. [Figure 1 b] The Glidepath preparation was done using Hyflex GPF Files. Final cleaning and shaping was carried out using Hyflex CM rotary files (Coltene-Whaledent, Switzerland) up to 4% 25 size of the instrument. Calcium hydroxide was used as an intracanal medicament and closed dressing was given for 2 weeks. In the second visit, the canals were irrigated with saline and dried with paper points. A master cone radiograph was taken with 25 size 4% Gutta percha [Figure 1c]. The cold lateral condensation method of obturation was performed using calcium hydroxide based sealer [Figure 1d]. The access restoration was done with composite resin to maintain a good coronal seal. The angle of

curvature was again measured by Schneider's method. The patient was given postoperative instructions and recalled for further follow up. At 6 months recall and follow up, the patient was absolutely asymptomatic and there was no radiographic sign of any periapical disease.

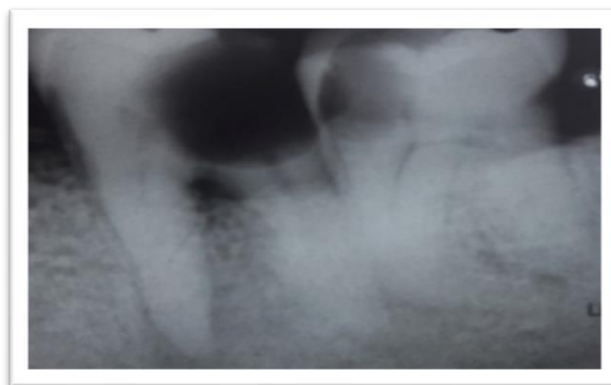


Fig 1 a: Preoperative radiograph.

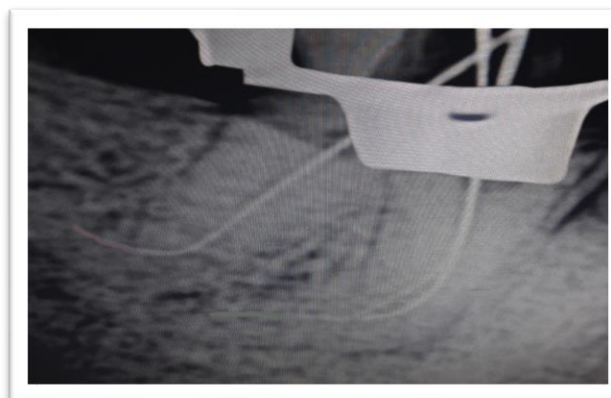


Fig 1 b: Working length radiograph

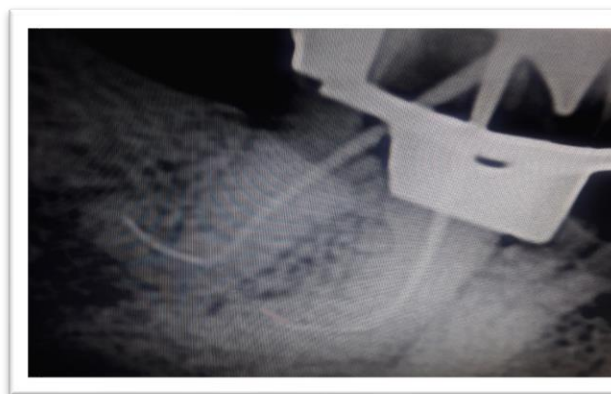


Fig 1 C: Master cone radiograph.



Fig 1 d: Obturation radiograph.

Case report 2

A 39-year-old female patient reported to the outpatient department of conservative dentistry and endodontics, with the chief complaint of pain in relation to lower left back tooth region. Clinical examination revealed deep occlusal caries in relation to mandibular left third molar tooth. The tooth was mildly tender on percussion. Medical history was non-contributory. Tooth was vital when pulp sensibility tests (Electric pulp test and heat test) were conducted. The radiographic examination revealed deep caries in close approximation to pulp with respect to 38, with no signs of periapical pathosis. Apart from these findings, the tooth showed severely curved root canal which was confirmed by schneider's method.

The procedure was explained to the patient. All the initial steps are same as discussed in the first case. Working length was determined by electronic apex locator and confirmed by radiograph [Figure 2a]. All the hand files were introduced with balanced force technique which maintains the instrument centrally in the canal. Special attention was given on frequent irrigation of the root canal and recapitulation. Final cleaning and shaping were carried out using Hyflex CM rotary files upto 30 size 4% . Calcium hydroxide was used as an intracanal medicament and closed dressing was given for 12 days. In the second visit, the canals were irrigated and obturated using Gutta percha [Figure 2b] and the postendodontic restoration was done. At 3 months recall and follow up, the patient was absolutely asymptomatic and there was no radiographic sign of any periapical disease.



Fig 2 a: Working length radiograph.



Fig 2 b: Master cone radiograph.

DISCUSSION

Successful endodontic treatment involves thorough cleaning and shaping of the canals. The canals with multiple curvatures along their length possess difficulty in root canal instrumentation by using conventional Ni Ti files.[9] We used Hyflex CM files in this study. Hyflex CM was introduced by Dr. Ricardo Caicedo and Stephen J. Clark in 2011. Hyflex CM made from innovative thermomechanical process of NiTi alloy with the property of "CONTROLLED MEMORY". These instruments are in martensite condition at room temperature and possess up to 339% higher fatigue resistance than standard NiTi files .(7)

Advantage of Controlled memory technology are most of the material memory is removed from the file. They are easy to follow the natural anatomy of

the root canal, stays centered within the canal and causes symmetrical cleaning of canal. After temperature of Hyflex CM - 47°C. They are operated at speed - 500 RPM and torque - 2.4 N·cm. Hyflex CM Files may respond to pressure, torque and resistance with a lengthening of the spirals. Unlike normal NiTi instruments, this can be reversed. During autoclaving (or treatment in a glass bead heater for 10 seconds), the instruments can regain their shape.⁽¹⁰⁾

Schneider's method was used to determine angle of curvature of root canals in this method and angle is measured before and after root canal treatment. It is the most commonly used method of determining angle of curvature by using radiographs. The root canals were classified as severely curved by measuring angle of curvature by Schneider's method and angle of curvature at the end of root canal treatment. The angle more than 20 degrees were classified as severely curved root canal by Schneider. The angle of curvature again measured at the end of root canal treatment to determine any change in root canal curvature. But there is very little change is seen before and after root canal shaping by using controlled memory files. ^(11,12)

CONCLUSION

A sound knowledge about internal anatomy of the tooth, thorough assessment of preoperative radiographs is crucial prerequisite in managing bends. To address challenging mid root curvatures, it is essential to remain patient, first negotiate canals by hand and consider using appropriate instrumentation techniques and customized treatment planning will help manage curved canals, prevent complications, and enhance the quality of the treatment.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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