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Case Report

Clinical insights into endodontic management of dilacerated maxillary premolars: A report of two cases

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Abstract

Effective endodontic therapy treatment necessitates by shaping and thorough cleaning of root canal's structure, which often presents multiple curvatures that complicate instrumentation. In both the cases discussed in the case report, there was sudden sharp pain on consumption of hot and cold food stuffs. On clinical examination, deep proximal caries in maxillary second premolar was seen in both the cases. Teeth were tender on percussion. Radiographic evaluation showed caries involving pulp, with periodontal ligament widening and sharp curvature in apical third region of the roots. These curvatures can lead to procedural errors like ledges and obstructions. This case report highlights the challenges in treatment of moderately to severely bent root canals (tooth number 15 and 25 respectively), emphasizing the importance of understanding root and canal morphology and use of appropriate instruments like pre-curved Ni-Ti files during canal shaping.

Keywords: Bayonet canal, Curved root canal management, Dilacerations; Endodontic treatment, Maxillary Premolar, Root canal treatment.

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1. Introduction

Effective endodontic therapy includes comprehensive shaping as well as cleaning of root canal system. Numerous curvatures occur in the majority of root canals, making canal instrumentation challenging. Because majority of the teeth have some bends or curves in the roots, straight root canals are less common than typical. Furthermore, the length of root canals may exhibit many planes of curvature. A dilacerated canal, a Bayonet or S-shaped canal, a progressive root curvature, or a sharp bend in the apical part of the root can all have different canal curvatures.[1] In 1848, John Tomes referred to these types of curves as "dilacerations."[1] It describes a variation or bend in straight line connection between tooth's coronal structure and root, as well as an angulation, acute bending, or curvature in tooth's radicular or coronal structure. Sever mechanical trauma to main precursor teeth may result in dilatation of underneath growing tooth bud and may lead to dilacerations.

The permanent tooth germ's calcified portion is moved such that the remaining, non-calcified portion creates an angle.[2] While displacements are common in both permanent and deciduous dentitions, but they are less in primary teeth as compared to permanent.

Both maxillary and mandibular jaws are equally affected. The incidence of dilacerations in teeth are as follows: mandibular second molar (1.6%), mandibular first molar (0.6%), and maxillary first molar (1.3%) are the teeth most commonly affected. The occurrence is rare in mandibular lateral incisor, canine, first premolar, maxillary canine, and second premolar. The complicated structure of root canal is a challenge for endodontic treatment since it requires complete shaping and cleaning, especially given the varied anatomical variations.[3]

Curvatures frequently result in ledge formations, obstructions, perforations, and apical transportation, among other procedural errors.[4] The elaborate and effective

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treatment of two cases with moderately to severely curved root canals is presented in this case report.

1.1. Case report 1

35-years old women reported to the department of Conservative Dentistry and Endodontics complaining of pain in maxillary right posterior region from past 2 months. The patient gave history of sensation to hot and cold. Diffuse pain for the past 2 months, which worsened over the last 3–4 days and also began during sleep, subsiding with medication. The intraoral examination revealed proximal caries with respect to 15,16. Tooth 15 was tender on percussion. The radiographic examination revealed a radiolucency spreading into the pulpal area without periapical pathological symptoms in relation to 15 and mesial Class II caries w.r.t 16. Regarding 15, vitality testing (cold and electrical) produced a strong, persistent discomfort following the removal of the stimulus. Radiographic examination revealed proximal caries involving pulpal, based on these findings, the diagnosis was symptomatic irreversible pulpitis with apical periodontitis in relation to15. In addition to these observations, the tooth displayed a dilacerated root. Root canal treatment followed by crown rehabilitation was suggested to the patient and informed consent was taken from before initiating the treatment.

1.2. Case report 2

28 years old male patient came to Department of Conservative and Endodontics with complaint of pain in relation to maxillary left back tooth region. Pain was spontaneous and sharp, and intensified with the consumption of hot food and beverages. Clinical evaluation showed deep disto-proximal caries in upper left second bicuspid. Tooth was tender on percussion. While performing pulp sensibility tests (electric pulp test and heat test) tooth was vital. The radiographic evaluation showed deep caries involving pulp, along with periodontal ligament widening. Apart from these findings, a sharp curvature in apical third area of the tooth was seen on the radiograph. The diagnosis of chronic irreversible pulpitis was made and endodontic therapy was planned following full coverage restoration of the tooth. Informed consent was taken from the patient before initiating the treatment.

1.3. Clinical management

Before the initiation of endodontic treatment, pre-operative radiographs (**Figure 1a** and **Figure 2 a**) were taken and the degree of curvature was determined with the help of Schneider method that showed severely curved canals in first case and moderately curved canals in relation to second case.[5] The tooth was anesthetized with 2% lignocaine (1:80,000). Under rubber-dam isolation, a traditional endodontic access cavity was created utilizing round carbide (ISO 014) and Endo-Z bur (Dentsply Maillefer, Ballaigues, Switzerland). Two canals, buccal as well as palatal were found. Once sufficient access was gained, initial inspection of the root canal was completed using K-files number 6 and 8 (Mani, Inc., Japan) after pre-curving them and patency was attained.

Working length was ascertained with the help of electronic apex locator (Propex; Dentsply Maillefer) and verified using periapical radiograph (EZ Sensor Classic IOS, Vatech, India) (**Figure 1b** and **Figure 2 b**). At first the pathfinder files made of stainless steel (Sybron Endo, Orange, CA, USA) in-between sizes, i.e., number 12 as well as 17 were utilized and filing was carried out using 17% EDTA following irrigation using saline as well as 5.25% sodium hypochlorite (NaOCl). Lastly root canal preparation was done with Hy-Flex CM rotary files (Coltene-Whaledent, Switzerland)) till size 25-4% taper of the instrument in both the cases. The canals were flushed using EDTA 17% and 5.25% sodium hypochlorite (NaOCl) followed by final flush with saline, then dried with the help of 25-4% paper points prior to obturation. Obturation done using single cone obturation technique with 25-4% taper gutta-percha (**Figure 1c** and **Figure 2 c**) with AH Plus sealer (Dentsply, USA), followed by composite resin restoration (Filtek Z350XT, 3M, Germany) and porcelain fused metal crown (**Figure 1d** and **Figure 2 d**).

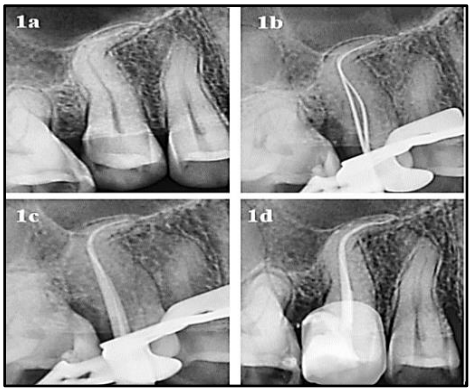

Figure 1: (a) Pre-Operative radiograph **(b)** Working length **(c)** Master cone **(d)** Obturation

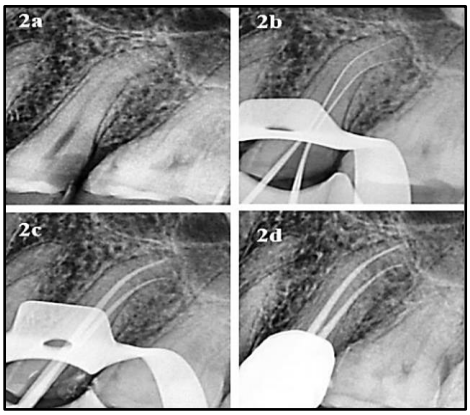

Figure 2: (a) Pre-operative radiograph working length **(c)** Master cone **(d)** Obturation

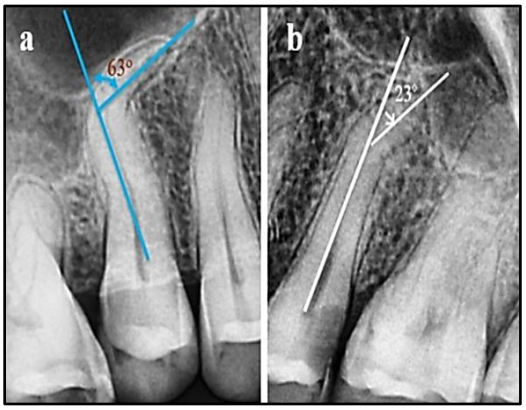

Figure 3: 3 Months follow up **(a)** Case 1 **(b)** Case 2

Figure 4: (a) Severe curvature **(b)** Moderately curved root.

2. Discussion

Precise canal cleaning and shaping are important for successful endodontic treatment; yet, root canal instrumentation can be challenging because to many curvatures present in most canals. In situations where there is atypical canal morphology, endodontic procedures often fail due to procedural errors such as elbow generation, ledge formation, damaged instruments, canal blockage and zipping.[1]

Different criteria have been proposed in the literature to identify root dilacerations which include, according to anatomic location (apical third, middle third, coronal third curvature), Shape-based curvature (Apical gradual curve, Sickle shape curve, Bayonet curve), Dobo-Nagy classification (Shape- straight, J-shape (apical curve), C-shape (entirely curve), S-shape (multi-curve).[6] Dilaceration has been defined by authors as a deviation of 20 degrees or more from the tooth's normal axis in the apical region of the root. A tooth may show signs of dilatation along its axis, either in the mesial or distal direction, or along its axis at an angle of 90 degrees or more.[7] The direction of curvature can be used to preserve a constant tapered shape and prevent damage of structure to the endodontic instruments.[3]

According to a 2005 study by Malćic´ et al., dilaceration is shown in apical one third of roots of incisors, canines, and bicuspids, but middle and cervical thirds of third molars are most frequently afflicted. Additionally, a number of publications found that the overall prevalence of premolars and maxillary anterior teeth (4.6%) is higher than rate affecting comparable region of the mandible (1.3%).[8] Schneider proposed a technique in which draw a line parallel to the long axis of the canal, within the coronal third; draw another line from the apical foramen till it intersects the point where the primary line leaves the long axis of the canal, this crossing point is the Schneider angle, used to determine the degree of root curvature.[9] And it falls into one of three categories: Severe: 25–70°, Moderate: 10–20°, and Straight: 5° or less.[5] (**Figure 4**)

Procedural errors are the primary reason why endodontic treatment fails in curved canals.[10] Understanding inside root configuration is necessary for endodontic treatment to be successful. In this instance, careful consideration was given to the radiographic evaluation, which aided in determining the canal design and root curvature.

Coronal pre-flaring, according to Guttman, aids in creating a glide path prior to the introduction of rotational NiTi files for biomechanical preparation as well as for tactile command of the whole dilacerated canal. Pre-flaring also improves cleaning since it retains more irrigant.5[5] Exceptional substitutes for number 6 and number 8 K files are Pathfinder files. These files offer the added benefit of stiffness and increased flexibility during canal navigation, making it easier to negotiate narrow and challenging canals.

During preparing curvature of canals, following rules should be considered:

1. Maintaining apical foramen towards its real spatial position.
2. Gaining straight-line access towards area of curvature.
3. Use instrument which closely adapts the original canal shape and its anatomy.

Based on Vertucci upper bicuspids teeth have most anatomic variations. One such variation which often occurs in maxillary bicuspid is ‘S ’shaped or bayonet shape canals of root. There are two curves in the S-shaped canal, the most challenging of which is the apical curve. These root canals have a very high risk of strip perforation. Guttman proposed that pre-flaring coronal of one third canal (at expense of tooth) to decrease curvature angle.[11]After procedure is finished, it’s easier to negotiate the remaining root canal. It is necessary to formulate a customized therapy for the managing curved canals and determining the curvature degree before beginning treatment. In case presented, Schneider method regarding curvature determination is followed, due of its wide acceptance and simplicity.[55]

All hand tools, particularly the Ni-Ti K files, should be pre-curved. Using smaller files (No. 6 or 8) also makes

negotiating curved canals easier and minimizes the transportation amount from dangerous places. Balanced force approach keeps the instrument central in the root canal, reduces apical debris ejection, and has a lower risk of iatrogenic injury.[12] In comparison to stainless steel, Ni-Ti alloys are softer, more robust, and exhibit shape memory and super elasticity (SE). They also have a lower modulus of elasticity. With benefits including less apical debris extrusion, less cervical binding of instruments, and efficient irrigation of apical one-third of canal, rotating files aid in flaring of the cervical third.[13]

HyFlex CM Ni-Ti files are controlled memory files. It has ability to follow the anatomy of canal closely, minimizing the risk of ledge formation risk, zipping and perforation. It can also be pre-bent, similar to the way of stainless-steel files. Therefore, these files were used in this case.

Therefore, after analysis of case, incorporating application of correct straight-line access, coronal pre-flaring, negotiation, as well as glide path, a severe root canal curvature can be safely, predictably and successfully shaped, cleaned and sealed.

3. Conclusion

Success depends on having a solid grasp of the tooth's internal anatomy in addition to a careful evaluation of preoperative radiographs. Curved canal management, problem prevention, and treatment quality improvement can be achieved with the use of appropriate instrumentation techniques and personalized treatment planning.

It is best to use hand files to traverse the canals for a while before switching to rotary files, being sure to irrigate the spaces between each file thoroughly. This approach must be consistently followed in order to successfully handle bent canals, which will eventually enhance treatment results and patient satisfaction.

4. Conflict of Interest

None.

5. Source of Funding

None.

References

1. Manjushree R, Prasad K. Application of cone-beam computed tomography in the management of dilacerated maxillary central incisor associated with radicular cyst and external root resorption - A case report. *J Conserv Dent*. 2021;24(4):399-403.
2. Topouzelis N, Tsaousoglou P, Pisoka V, Zouloumis L. Dilaceration of maxillary central incisor: a literature review. *Dent Traumatol*. 2010;26(5):427-33.
3. Jafarzadeh H, Abbott PV. Dilaceration: review of an endodontic challenge. *J Endod*. 2007;33(9):1025-30.
4. Chaniotis A, Ordinola Zapata R. Present status and future directions: Management of curved and calcified root canals. *Int Endod J*. 2022;55(3):65684.
5. Schneider SW. A comparison of canal preparations in straight and curved root canals. *Oral Surg Oral Med Oral Pathol*. 1971;32(2):271-5.
6. Sahay S, Raj S, Nikhil V. Management of root canal curvatures and review. *IP Indian J Conserv Endod*. 2023;8(2):69–73.
7. Das S, Warhadpande MM, Redij SA, Sabir H, Shirude T. Management of synodontia between dilacerated permanent maxillary central incisor and supernumerary tooth with aid of cone-beam computed tomography. *J Conserv Dent.* 2015;18(2):163-7.
8. Malc ic A, Jukic S, Brzovic V, Miletic I, Pelivan I, Anic I. Prevalence of root dilaceration in adult dental patients in Croatia. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2006;102(1):104–9.
9. Parikh H, Bharatiya R, Ujariya U, Kothari A. Curved paths: A comprehensive review and case insights into root canal anatomy. *J Conserv Dent Endod*. 2024;27(12):1310-4.
10. Sakkir N, Thaha KA, Nair MG, Joseph S, Christalin R. Management of dilacerated and S-shaped root canals: an endodontist's challenge. *J Clin Diagn Res.* 2014;8(6):22–3.
11. Guttman JL. Problem solving in endodontics. 3rd ed. Missouri: Mosby - Year book Inc; 1997. p. 116.
12. Riitano F. Anatomic endodontic technology (AET) – A crown down root canal preparation technique: Basic concepts, operative procedure and instruments. *Int Endod J.* 2005;38(8):575-87.
13. Bergmans L, Van Cleynenbreugel J, Wevers M, Lambrechts P. Mechanical root canal preparation with NiTi rotary instruments: rationale, performance and safety. *Am J Dent.* 2001;14(5):324-3.

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