CASE REPORT

"IT'S A NUMBER GAME": ENDODONTIC THERAPY OF MAXILLARY FIRST MOLAR WITH SIX CANALS A CASE REPORT

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ABSTRACT

The aim of this article is to discuss the endodontic management of a maxillary first molar with six root canals and to emphasize the importance of having a thorough knowledge about the root canal anatomy. Nonsurgical endodontic therapy of a right maxillary first molar with three roots and six root canals was successfully performed. The canal morphology was diagnosed using a dental operating microscope and multiple angled IOPA. After good access preparations dental operating microscopes are excellent auxiliary clinical tool to locate the extra root canals.

Key-words:

Maxillary first molar, root canals, anatomic variations, dental operating microscope, apex locator.

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INTRODUCTION

The main objective of an endodontic treatment is to complete a thorough mechanical and chemical cleaning of the entire root canal system and its obturation with inert filling materials. Therefore, a better understanding and knowledge of the root canal system is very essential for successful endodontic therapy.[1]

It is not only critical to know the normal or the usual configuration of the pulp, but it is equally important to be aware of the variations. The anatomical variations include fused canals, ramifications, extra canals and presence of extra roots in teeth.

It is generally accepted that a major cause of failure of root canal therapy is inability to recognize the presence of and to adequately clean, shape and fill all the canal systems. A canal may go untreated because the clinician fails to detect it. Therefore it is extremely important that clinicians use all the armamentaria at their disposal to locate and treat the entire root canal system.[2]

The root canal anatomy of maxillary first molars has been described as 3 roots with 3 canals and the commonest variation is the presence of a second mesiobuccal canal (MB_2).[4,5]Numerous case reports are documented with a wide variation in both root and root canal anatomy. The variations in root form include single root,[6] fused buccal roots,[7,8]and two palatal roots.[9] Patterns of root canal configuration are diverse ranging from one,[6] two,[10] five,[11] six,[12]C-shaped canal system[13]and seven[14] root canal systems. In this article we describe endodontic management of maxillary first molar with 6 root canals.

CASE REPORT

A 28 year old male patient reported to Dept. of Conservative Dentistry & Endodontics, MMCDSR, Mullana, with a chief complaint of pain in upper right back region. Patient gave history of spontaneous and lingering pain on taking hot and cold. On oral examination, a deep carious lesion was observed in the maxillary right first molar. The tooth was tender to percussion and mobility was within physiological limits. Pulp sensitivity testing of the involved tooth that was carried out using heated gutta-percha stick and Endo ice (Hygenic, USA) caused an intense lingering pain. Electric pulp stimulation (Parkel Electronics Division, NY) elicited a delayed response. Preoperative IOPA showed translucency in the crown approaching the pulp space (Fig.1). A diagnosis of irreversible pulpitis with symptomatic apical periodontitis was made and a conventional endodontic treatment for 16 was planned.

Radiographic evaluation of the involved tooth indicated abnormal root canal anatomy. The tooth was anesthetized with1.8 mL 2% lignocaine containing 1:200,000 epinephrine (lignospan special, Septodont). After caries excavation, proximal surface of tooth 16 was restored with posterior composite resin (P 60, 3M ESPE, USA) for optimum rubber dam placement. An endodontic access cavity was established under rubber dam isolation. Initially, the mesiobuccal (MB), the distobuccal (DB), and two palatal canals (P_1 and P_2) were located. (Fig.: 2). Floor of pulp chamber was further observed under Dental Operating Microscope (Global G6, Unicorn) and two additional orifices (MB_2 and DB_2) were located(Fig.: 2). The canal MB and DB therefore renamed as MB_1& DB_1.(Fig.: 2) Coronal enlargement was performed with a nickel-titanium HERO orifice shaper (MicroMega, France) to improve the straight-line access to all the root canal orifices. The working length was established with the help of an apex locator (Root ZX, J Morita, USA) and later confirmed using a radiograph (Fig.: 3). Multiple working length radio-graphs were taken at different horizontal angulations for further understanding of root canal morphology and correct determination of working length. Biomechanical preparations were performed using Hero Shaper nickel-titanium rotary instruments with a crown-down technique. Irrigation was performed using 2.5% sodium hypochlorite solution, and 17% EDTA. The canals were dried with absorbent points, and obturation was performed using cold lateral compaction of gutta-percha and AH Plus resin sealer (Maillefer, Dentsply). The tooth was then restored with posterior composite (P-60, 3M ESPE, USA) (Fig. 4). The patient was advised a full-coverage crown.

Fig. 1: Pre- operative Radiograph of 16

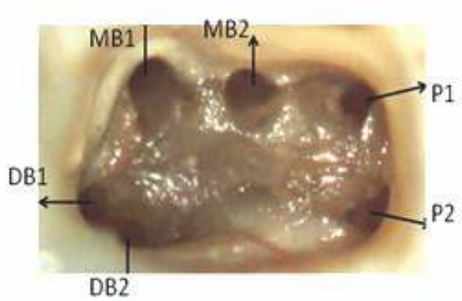

Fig. 2- six canals orifices located

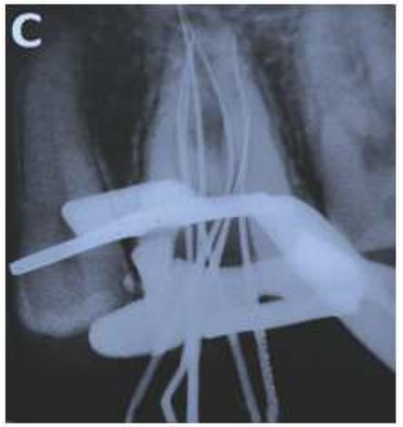

Fig.3- Working length determination

Fig.: 4 - Post- obturation Radiograph of 16

DISCUSSION

The anatomy of teeth is not always normal and a great number of variations could occur in formation, number of roots, and their shape. Most dentists are used to treating normal root canal configurations and therefore deviations from the norm could lead to failure in root canal therapy. These findings although rare, an endodontic practitioner must be equipped to successfully manage root canal aberrations.[16]

Clinically inspection during endodontic treatment with or without magnification tools, radiography, and review of patient records are the methods to find extra canals in the teeth. Currently, technologic advances have been developed allowing treatment of endodontically involved tooth that is more accurate, non-destructive and feasible in-vivo.

Radiographs provide important information about root canal morphology, therefore careful evaluation of two or more periapical radiographs, exposed at different horizontal angulations of the x-ray cone is mandatory. However conventional radiographs may not always determine the correct morphology, owing to its limitations.[2]The greatest limitation of

radiographs is that it provides only 2- dimensional information of 3–dimensional reality; hence it is deficient in that it does not provide information concerning the bucco-lingual aspects of the tooth roots where superimposition of anatomic structures impedes detection of small structural density changes.[5]

The operating microscope was introduced to endodontics in 1991, and has significantly improved magnification and illumination. Because operating microscope has become more widely used in non-surgical treatment procedures, clinicians have indicated that it facilitates detection of very fine canals. One clinical simulation study demonstrated an increase in the number of MB_2 canals located from 51% without the use of operating microscope to 82% with operating microscope.[7]

Several studies have investigated the anatomy of root canal systems and the anatomical variations found in the different types of teeth.[19,20,21] These have provided information that might improve the outcome of endodontic treatment. Out of the various laboratory ex-vivo studies in the dental literature only two have reported the presence of 6 or more root canals in maxillary first molar and with an incidence of 0.31- 0.72%.[22]conversely; several case reports have documented the existence of 6 or more root canals in maxillary first molar.

Knowledge from laboratory studies is essential to provide insight into the complex root canal anatomy. Failure to detect and treat the entire canal system will result in a decreased long-term prognosis Stropko observed that by scheduling adequate clinical time, by using the recent magnification and detection instrumentation aids and by having thorough knowledge of how and where to search for extra canals, the rate of location can increase in maxillary first molars.[6]

The detection of additional root canals requires a careful clinical and radiographic inspection. Beer & Bauman suggested geometrical techniques to identify missed canals in maxillary molars. They proposed three lines; the first line connected the mesiobuccal canal to the palatal canal; the second line was drawn perpendicular to line one, at a point one-third the inter-canal distance from the palatal canal, such that, this line passed over the distobuccal canal. The distobuccal canal might be somewhere along line 2. A fourth canal lay somewhere along line 3, which deviated approximately 10°.[2] Furthermore, there are multiple concepts, armamentaria and instruments that are useful to find these aberrant canals which include the use of endodontic explorers, DOM, micro-openers, properly designed access cavity, bubble test, champagne test, transillumination, use of piezoelectric ultrasonics, looking for the rules of symmetry and perio-probing.

CONCLUSION

The maxillary first molar root anatomy is predominantly a three rooted form, as shown in all anatomic studies of this tooth. The two rooted form is rarely reported, and may be a result of fusion of thedistobuccal root to palatal root or fusion of the distobuccal root to the mesiobuccal root. The C-shape root canal system morphology is also a rare anomaly. The four-rooted anatomy in its various forms is also very rare in the maxillary first molar and is more likely to occur in the second or third maxillary molar.

The dental microscope is an exciting tool for experimental endodontology and can produce detailed informative images of the anatomy of teeth. The technique is suitable for clinical use, but it can become a powerful tool for research. It also can allow for better preclinical training in fundamental procedures of endodontic treatments, and it gives clinicians and researchers who desire to study dental anatomy in detail a new means of doing so.

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