DOI: 10.15386/cjmed-778

ENDODONTIC MANAGEMENT OF MAXILLARY THIRD MOLAR WITH MB2 (VERTUCCI TYPE IV) CANAL CONFIGURATION DIAGNOSED WITH CONE BEAM COMPUTED TOMOGRAPHY – A CASE REPORT

PRADEEP JAIN, PALLAV PATNI, PANT YOGESH, VYAS ANUP

Department of Conservative Dentistry and Endodontics, Sri Aurobindo College of Dentistry, Indore, M.P, India

Abstract

The endodontic treatment of maxillary third molar often poses a challenge even to an experienced endodontist because of their most posterior location in the dental arch, aberrant occlusal anatomy, abnormal root canal configuration and eruption patterns. Owing to these anatomical limitations, their extraction remains the treatment of choice for many clinicians. As we know, retaining every functional component of the dental arch is of prime importance in contemporary dental practice. This clinical case report aims to discuss the endodontic treatment of maxillary third molar with MB2 root canal separated throughout the length and exit at two separate apical foramina (Vertucci type IV) diagnosed with Cone Beam Computed Tomography (CBCT)..

Keywords: endodontic treatment, maxillary third molar, Cone Beam Computed Tomography, Dental Operating Microscopes

Introduction

Despite the increased awareness amongst the patients, maxillary third molars always are prone to develop tooth decay owing to their most inaccessible location in the arch and wrinkled occlusal anatomy which would favor the accumulation of the plaque and interfere with optimum cleaning. Besides, they usually have the abnormal eruption patterns, which also make them susceptible to dental decay. Owing to these complications, the extraction of the third molar is the usual choice for all practitioners unless the tooth is strategically important.

Retaining every functional component of the dental arch, including the third molars, is the principal goal of contemporary dental practice. In certain clinical situations retaining such teeth is even more important if they are to serve as the convenient abutment for fixed prosthesis.

The root and root canal morphology of maxillary third molars show an increased likelihood for aberrations either in number of roots or the canal configuration. The number of roots in maxillary third molar teeth ranges from one to five and number of encased root canal has been reported from one to six. However, the single, double and three rooted variants, either separate or fused, encasing one to four root canals are considered most common.

The internal anatomy of the mesiobuccal (MB) root in maxillary third molars has been investigated more than any other root. However, few studies examined the occurrence of second mesiobuccal canal (MB2) in third molar teeth. Green found that the prevalence of MB2 in MB root of maxillary third molars was 37% in which 25% of the MB2 were type II and 12% were type IV [1]. In an in vitro investigation of 50 maxillary third molars, Pecora et al. found that 68% of MB2 canals have root canal type I, while root canals types IV and V were only presented in 14% and 18%, respectively [2]. In 1999, Stropko evaluated the endodontic treatment of 20 maxillary third molar teeth, and found only 20% of the study subjects having a MB2 in which all of them where joined and ended in a single foramen [3].

The internal anatomy of the MB root in maxillary third molars has also been examined in some population groups. In a Burmese population, Ng et al. reported 22.2%, 11.15 and 5.6% of the MB root in maxillary third molars

Manuscript received: 07.02.2017
Accepted: 17.03.2017
Address for correspondence: pradeep.endodon18@gmail.com

having root canals types IV, II, VII, respectively [4]. In a Thai population, Alavi et al. demonstrated single canal type I in the MB root in only 54.5%, and seven different root canal configurations were identified in 45.5% of the specimens [5]. In a recent morphological study on a Turkish population by Sert et al. 22.22% of the root canal configurations in the MB root were types II, IV and V [6].

This case report aims to discuss the endodontic management of maxillary third molar with MB2 root canal configuration (Vertucci type IV) diagnosed with CBCT.

Case report

A 40-year-old male reported to the department of conservative dentistry, with a chief complaint of food impaction and pain in the last right upper molar region. The pain started a month ago and was dull, gnawing in nature with moderate intensity. He reported to the clinic only when the pain became severe. On clinical examination, it was observed that the maxillary right third molar had a deep distoproximal and occlusal caries with an exposed pulp. The tooth was severely tender on percussion and had moderate pain on palpation. Pulp testing with electric pulp tester (Parkell Inc. Edgewood, NY, USA) and thermal test using hot gutta- percha (GP) elicited non-responsiveness from the suspect tooth. Conventional intraoral periapical radiograph failed to provide adequate information regarding the canal configuration and all the roots looked fused and their outline were not clear (Figure 1a). CBCT provides three dimensional imaging and reasonably high resolutions that would aid in better understanding in identifying the root and root canal morphological features. Hence, CBCT was advised to the patient. After careful evaluation of axial sections at coronal, middle and apical third and sagittal section, it was confirmed that MB root had an additional MB2 canal which was separated throughout the length from MB1 and exited as two separate apical foramina, thus confirming the Vertucci type IV root canal configuration (Figures 1 b,c.d,e).

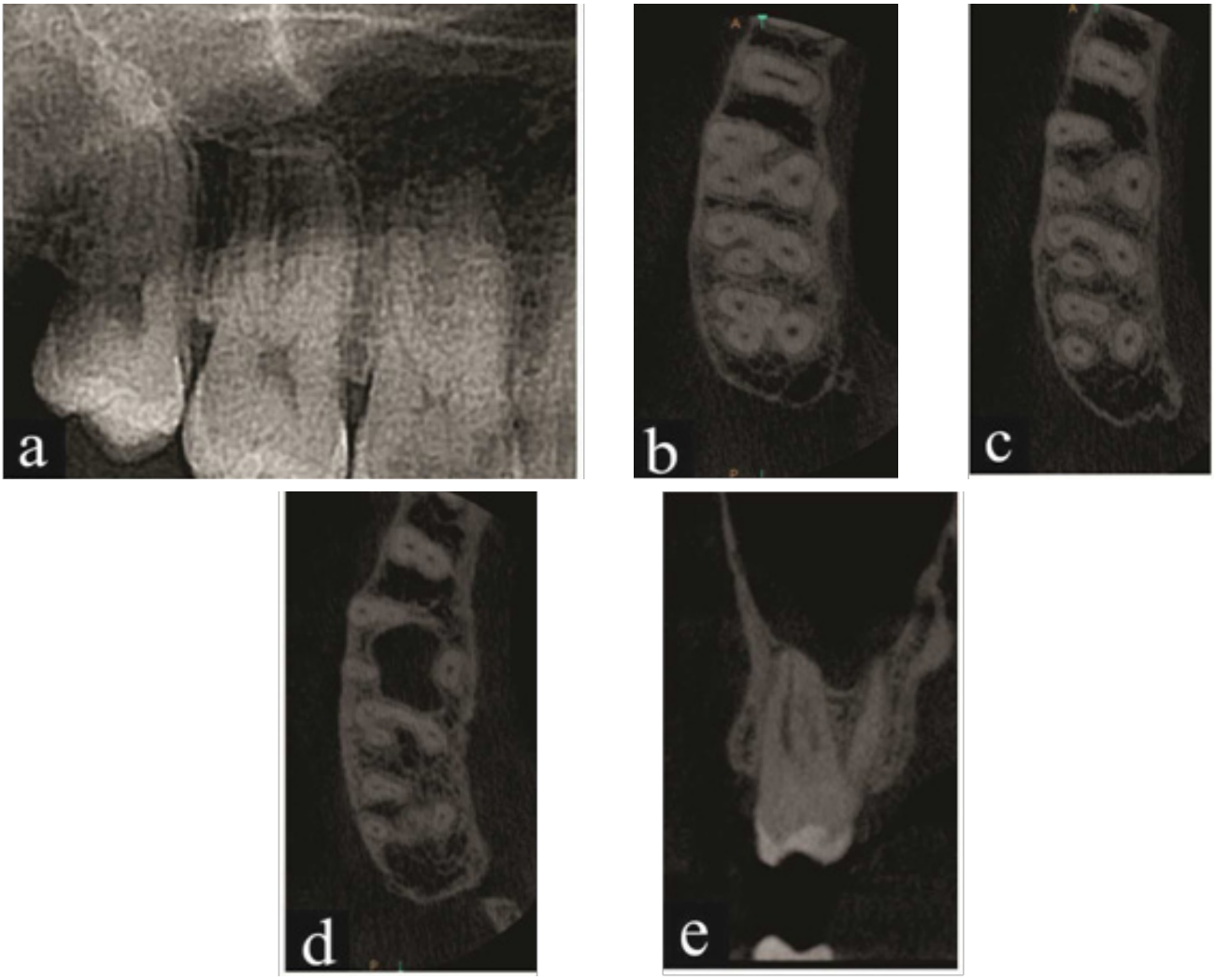

Figure 1. a) Preoperative radiograph; b) The limited volume CBCT axial scan at coronal third; c) The limited volume CBCT axial scan at middle third; d) The limited volume CBCT axial scan at apical third; e) The limited volume CBCT sagittal scan confirming Vertucci type IV canal configuration.

By evaluating the tooth clinically, radiographically and dental imaging, a diagnosis of pulpal necrosis with an acute apical periodontitis was made and an endodontic approach was planned for this tooth.

Rhomboidal shape access was made to gain entry to the pulp chamber after administration of local anesthesia (2% lignocaine with 1:1,00000 epinephrine). Placement of rubber dam for isolation was not possible owing to poor accessibility. After careful extensions of the access cavity under the magnification and illumination of dental operating microscope (DOM) (Global Surgical corporation St. Louis MO, USA) 8x, all the three root canal orifices were visible at the floor but the orifice for MB1 was hidden under the thin shelves of the dentin (Figure 1f). The mesial marginal ridge was infringed upon to achieve enough access to reveal the mesially positioned and mesially inclined MB2canal. Slow-speed Mueller burs (Brasseler, Savannah, GA, USA) were used with a brushing motion between the MB and the palatal canal orifice to remove the dentinal shelves that overlay the anticipated MB2 canal orifice using intermittent irrigation with 5.2% sodium hypochlorite (NaOCl) solution and were examined under the DOM at 8x. An ultrasonic nonactive tip with active lateral part Start-XTM #2 (Dentsply Maillefer) was introduced with a Piezo ultrasonic generator (EMS Minipiezon) at medium speed and with light force along the MB sub-pulpal groove extending palatally from the main MB canal orifice, with continuous water irrigation. MB2 orifice was located. After locating the MB2 orifices, the patency of all the four root canals was checked with #10 K file (Kerr USA). The working length was determined by Root ZX II (J. Morita, Kyoto, Japan) apex locator for all the four root canals and confirmed by a radiograph (Figure 1g). A sterile paper point was inserted in to the MB2 to determine if it joined with the MB1. The fluid level in MB1 was found to be remaining same in volume, therefore confirming two separate root canals in MB root throughout the length thus confirming Verucci type IV canal configurations. The root canals were cleaned and shaped by rotary nickel-titanium ProTaper instruments (Dentsply, Maillefer) using Glyde (Dentsply, Maillefer) as a lubricant. The canals were sequentially irrigated using 5.2% NaOCl and 17% ethylyne diamine tetraacetic acid (EDTA) during the cleaning and shaping procedure. Selected master GP were placed in all the canals and a check radiograph was taken to evaluate the fit (Figure 1h).The canals were thoroughly dried and were coated with AH-plus resin based sealer (Dentsply Maillefer). Obturation was carried out using the ProTaper GP points. Immediate post obturation radiograph showed well obturated root canals (Figure 1 i).The access cavity was restored with posterior composite resin (ClearfilmajestyTM posterior, Kuraray America, Inc. NY, USA). The patient was asymptomatic during follow-up after 3 months (Figure 1j) and six months (Figure 1k) and was advised to get the final post endodontic restoration done for the tooth.

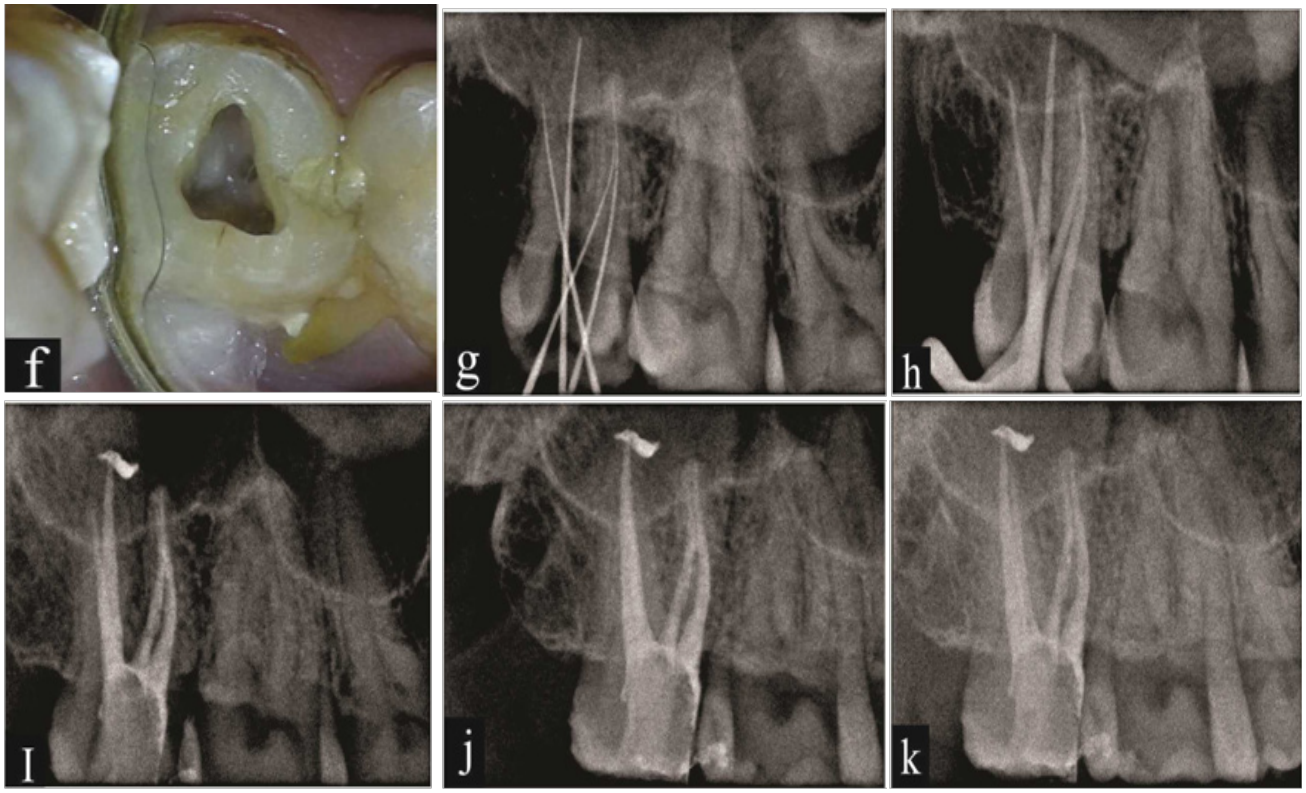

Figure 1. f) Access cavity preparation under DOM 8x; g) Working length radiograph; h) Radiograph with master guttapercha in place; l) Immediate post obturation radiograph; j) Follow up radiograph after three months; k) Follow up radiograph after six months.

Discussion

The maxillary third molar has one of the most complex root and canal anatomy. The presence of a MB2 canal in the MB root of the maxillary third molars has been the subject of many discussions and studies.

An inability to detect and treat MB2 canal is a reason for endodontic failure in maxillary molars. Endodontically retreated teeth were found to contain more undetected MB2 canals than first-time treated teeth, suggesting that failure to treat existing MB2 canals leads to a poorer prognosis [7].

John J. Stropko 1999 studied the incidence of MB2 in the MB root of maxillary molars. There was a higher frequency of MB2 canals 73.2% in the maxillary first molars (U1M), 50.7% in maxillary second molars (U2M) and a smaller percentage 20.0% in the maxillary third molars (U3M). A higher incidence of separate MB2 canals 54.9% was recorded in U1M than in U2M and joined in all U3M [3]. The presented case report also showed an additional MB2 root canal which was separated throughout the course and exit as two separate apical foramina therefore confirming Vertucci type IV canal configuration.

With the advent of newer imaging technology like CBCT, a better understanding of root and root canal configuration is possible. However, it should be prescribed only after weighing the cost of radiation exposure with the benefit of the diagnostic information that can be obtained from the scan [8]. In the presented case report since the conventional radiograph did not give the relevant information, hence CBCT was advised to the patient, which clearly indicated the presence of an MB2 root canal with Vertucci type IV canal configuration.

With the routine use of the DOM, specific instruments were required to enhance the effectiveness of the clinical procedure. In the presented case report a troughing process was utilized as MB2 orifice was hidden under the thin shelves of the dentin. It was essential to locate most MB2canals, and this can be accomplished either with burs or ultrasonic instruments. With the advent of newer sets of ultrasonic, the troughing process has become faster and cleaner. In the presented case report specific Mueller burs were used followed by the ultrasonic Start X tip # 2, an MB2canal scouter for locating the orifice of hidden MB2 canal.

In most teeth, the locations of MB2 canal orifices agree with the findings of several authors. The MB2 orifice were usually found mesial to an imaginary line between the MB1 and palatal orifices and about 2 to 3 mm palatal to the MB 1 orifice. This imaginary line is more appropriately described as an arc with an apogee toward the mesial, following the contours of the mesial surface of the root. In the presented case report the MB2 orifice was located mesial to an imaginary line between the MB I and palatal orifices, and about 2 mm palatal to the MB1orifice.

The MB2 canal can be very challenging to negotiate even for an experienced endodontist. The MB2 canal usually has a remarkable mesial incline just apical to its orifice in the coronal 1 to 3 mm. When the instrumentation is done for MB2, the tip of the file tends to catch against the mesial wall of the canal, preventing its apical progress. Since the MB2 canal is smaller and usually more calcified than MBI, the problem is accentuated [3]. To facilitate its location and instrumentation, the access has to be rhomboidal in shape to allow the necessary mesially directed shaping. Since CBCT has confirmed the presence of an additional MB2 root canal, to explore this, a rhomboidal access cavity was prepared. In the presented case since the MB2 was hidden and finer as compared to MB1, proper care has been taken to negotiate it with fine 10# K file using glyde as a lubricant.

Yoshioka et al. found that both magnification and dentin removal under magnification were effective in detecting the presence of MB2 canals. Particularly the authors could detect the MB2 canal in 7% of cases without the microscope, in 18% of cases using magnification and in 42% of cases using ultrasonic tips under the operating microscope [9]. Furthermore, the use of ultrasonic instruments under magnification enhances precision and reduces the risk of complications like ledges and perforations. In the presented case the illumination and magnification was achieved with the use of DOM with 8x.

Conclusion

The maxillary third molar has one of the most complex root and canal anatomy.

The presence of a MB2 canal in the MB root of the maxillary third molars has been the subject of many discussions and studies.

It is important that the clinician should have a strong conviction for the presence of an additional MB2 canal in 100% cases until it is proven otherwise. In conjunction with the DOM, use of current diagnostic aid likes CBCT, a rhomboidal access preparation, specific burs and newer set of ultrasonic instruments is highly recommended to enhance the visualization of MB2 systems. The use of ultrasonic tips under the magnification of DOM may be more conservative and it allows us for clear visualization of the pulpal floor as well as the missed root canal orifice.

Acknowledgement

The authors are grateful to Dr. Vinod Bhandari, Chairman, Sri Aurobindo College of Dentistry (SAIMS), Indore, Dr. Mahak Bhandari, Director, Mohak super specialty centre, Indore, for providing all necessary facilities and infrastructure for the research work.

References

1. Green D. Double canals in single roots. Oral Surg Oral Med Oral Pathol. 1973;35:689-696.
2. Pécora JD, Woelfel JB, Sousa Neto MD, Issa EP. Morphologic study of the maxillary molars. Part II: Internal anatomy. Braz Dent J. 1992;3:53-57.

3. Stropko JJ. Canal morphology of maxillary molars: clinical observations of canal configurations. J Endod. 1999;25:446-450.
4. Ng YL, Aung TH, Alavi A, Gulabivala K. Root and canal morphology of Burmese maxillary molars. Int Endod J. 2001;34:620-630.
5. Alavi AM, Opasanon A, Ng YL, Gulabivala K. Root and canal morphology of Thai maxillary molars. Int Endod J. 2002;35:478-485.
6. Sert S, Sahinkesen G, Topçu FT, Eroğlu SE, Oktay EA. Root canal configurations of third molar teeth. A comparison with first and second molars in the Turkish population. Aust Endod J. 2011;37:109-117.
7. Westesson PL, Carlsson LE. Anatomy of mandibular third molars. A comparison between radiographic appearance and clinical observations. Oral Surg Oral Med Oral Pathol. 1980;49:90-94.
8. Ball RL, Barbizam JV, Cohenca N. Intraoperative endodontic applications of cone-beam computed tomography. J Endod. 2013;39(4):548-557.
9. Yoshioka T, Kikuchi I, Fukumoto Y, Kobayashi C, Suda H. Detection of the second mesiobuccal canal in mesiobuccal roots of maxillary molar teeth ex vivo. Int Endod J. 2005;38(2):124-128.