Root Canal Morphology of Mesiobuccal Root of Permanent Maxillary First Molar Teeth in Himachal Pradesh (India) Population, Using A - Tooth Clearing Technique

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I. INTRODUCTION

“those who have dissected or inspected many [bodies] have at least learnt to doubt; while others who are ignorant of anatomy and do not take the trouble to attend it are in no doubt at all”. (Giovanni Battista Morgagni).

Since prehistoric times, when people have had issues with their teeth, there have been other people there to help. How we care for our teeth has changed over the past several thousand years, and today we call the professionals who care for our teeth dentists. Evidence of dental decay has been found in teeth from skulls that are 25,000 years old and archaeologists have evidence of the first dental fillings in teeth from people who lived around 8000 BC. Determining the racial affinity of an unknown individual from dentition for identification is indeed a difficult endeavor. However, there are certain dental characteristics which are predominant in certain racial groups and these contribute important indicators in the identification process. Inherited dental characteristics are modified by prenatal and postnatal environmental and nutritional conditions. They can also become less discernible due to admixture of the various races. Recognition of variations in root canal anatomy is an essential prerequisite for successful endodontic diagnosis and treatment. The complexities of internal anatomy are often masked by the external surfaces, which have a relatively simple and uniform anatomy. Internal complexities of the root canal are genetically determined and have definitive importance in anthropology, thereby necessitating the identification of root canal morphologies of different ethnic populations. Dental caries, because of its ubiquitous nature, remains one of the most prevalent afflictions of mankind. This disease can aptly be termed as a scourge of modern civilization. No nation or continent has escaped the ill effects of this deadly malady. Permanent first molar teeth are frequently affected by caries at an early age and may require root canal treatment for long-term retention. The morphology of both permanent first molars has been studied and it is accepted that the mesial root of maxillary first molars and the distal roots of mandibular first molars often have more than one canal. In general, the second canal of the distal roots of mandibular first molars is more easily located and treated than the second canal in the mesiobuccal root of maxillary first molars which tends to be elusive. The maxillary permanent first molar tooth has been described as “possibly the most treated least understood posterior tooth”. The form and number of root canals in the mesiobuccal root is principally determined by the deposition of secondary dentine. Generally an important aid in detection of extra root canals is careful study of radiographs. However when dealing with maxillary first molars an extra mesiobuccal canal is rarely seen on the original examination film, due to its small size and close relationship to the main mesiobuccal canal. Various researches concluded that failure to find and treat existing MB2 canals would decrease the long-term prognosis. If the initial treatment was completed by the same operator, it would be very challenging to detect a missed MB2 canal in retreatment without new technology. False assumptions about the root canal anatomy of teeth may lead to misdiagnosis, improper debridement, step formation and breakage of instrument during root canal treatment. Problems faced during endodontic treatment of permanent molar teeth indicate the need for increased knowledge of the anatomy of root canal systems.

II. AIM

To investigate the root canal morphology of mesiobuccal root of maxillary first permanent molar teeth collected from various dental clinics in Himachal Pradesh (India) population.

III. OBJECTIVES

To study
(i) The morphology of Mesiobuccal root.
(ii) To determine the frequency of Mesiobuccal 2 canal in the mesiobuccal root.
(iii) Root canal configuration using Vertucci’s classification.
(iv) Presence and location of lateral canals and intercanal communications.
(v) Presence and location of apical Foramen.
IV. METHOD

Extracted teeth were collected from various government run and private clinics of Himachal Pradesh and then were stored in Cloramine T solution (HEZE Kingvolte chemical co.ltd. China). Hard and soft tissue deposits were removed with the help of ultrasonic scaler and scrubbed under running tap water. Samples were then kept in 5.25% Sodium Hypochlorite (Dentpro, Amrit chemicals Ltd, Mohali, Punjab, India) for 30 minutes for removal of organic debris. The pulp chamber was accessed using round bur (Mani) and Endo Z bur (Dentsply) in a high speed Air rotor hand piece (NSK Japan). Teeth were kept in 5.25% Sodium Hypochlorite (Dentpro, Amrit chemicals Ltd, Mohali, Punjab, India) for 30 min for the dissolution of the pulp remnants. After this the teeth were then washed under running tap water and kept overnight to dry. India ink (Himedia Laboratories Pvt. Ltd., Mumbai, India) was then injected into the root canals using syringe with 27 gauze needle (Sterican, Braun Medical India Pvt. Ltd., Mumbai, India) under negative pressure at the apical end using suction apparatus till the ink crossed the apex. After injecting the ink the teeth were kept to dry overnight. Samples were then kept in freshly prepared 5% Nitric Acid solution (Aries Laboratories, Ahmedabad, India) for 3 days for decalcification, the solution was changed daily, and manually agitated threetimes daily. Demineralisation was assessed with the help of radiovisiography. The decalcified teeth were then rinsed under running tap water for 4 hours and dehydrated in solution of 70%, 80%, 95% ethyl alcohol (Changshu Yanguan Chemicals, China) successively for 24 hours.

V. MATERIALS AND METHOD

Dehydrated samples were then placed in Methyl Salicylate (Vikas Pharma, Mumbai, India) to enhance translucency for 3 days and then observed under Steriomicroscope for:

(i) The morphology of mesiobuccal root.
(ii) To determine the frequency of mesiobuccal 2 canal in the mesiobuccal root.
(iii) Root canal configuration using Vertucci’s classification.
(iv) Presence and location of lateral canals and intercanal communications.
(v) Presence and location of apical foramen.

VI. RESULT

1. The morphology of mesiobuccal root

The mesiobuccal root is broad bucco-lingually and slender mesio-distally.

ROOTS PRESENT:

Out of 600 permanent maxillary first molars 593 teeth had 3 roots (98.83%) 1 tooth had 4 roots (.16%) 6 teeth had 2 roots (1%) which had mesiobuccal and distobuccal roots fused but all had 3 separate canals.

VII. NUMBER OF APICAL FORAMEN:

Out of 600 mesiobuccal roots 312 roots have single apex. (52%)

Out of 600 mesiobuccal roots 288 roots have two or more canals (48%)

VIII. DISCUSSION

The clinical impact of missed anatomy can be clearly demonstrated with the large number of re-treatment case reports available in the literature; in the majority of these cases, failure of endodontic therapy is associated with untreated canal space. Localization and treatment of the missed anatomy typically leads to complete clinical and radiographic healing. Finally, untreated canal space may be associated with a remarkable variety of symptoms ranging from a symptomatic teeth to acute responses to hot and cold stimuli and from slight sensitivity to percussion and/or palpation to acute abscesses. The variability of symptoms and diagnostic and therapeutic difficulties make the treatment of missed anatomy a challenge for the general dentist.2 Thorough knowledge of tooth anatomy and the incidence of aberrancy in regional population being treated by the dentist can thus be helpful. Tooth clearing technique has been used by various researchers since over 100 years to study the human dental pulp morphology. It is easy to perform, inexpensive and has considerable value in the study of root canal anatomy, for it gives a three dimensional view of the pulp cavity in relation to the exterior of the tooth. Combination of nitric acid and methyl salicylate was used in the present study as was found to be the best (Gupta et al 2014) for three dimensional view of root canal morphology. Regarding three separate root anatomy Cleghorn et al11 analysed data from four anatomical studies and found that the maxillary molar normally has three roots (96.2% of 416 teeth) which is in coincidence with the results of our study that is, 1 tooth (16%) was found with four roots. The fourth root was conical in shape and about half the length of mesiobuccal and distobuccal roots and present between the distobuccal and mesiobuccal root. In the samples six teeth (33%) were found with fused roots (distobuccal and Mesiobuccal roots) and all of them had separate root canals1. The result of study conducted by Yang et al12 found 2% maxillary molars with distobuccal and palatal root fused in Chinese population. No tooth was found with single root, rest 593 teeth had three roots which is in coincidence with our study33. According to Cleghorn et al35 two roots were found in 16 (3.8%) of the teeth studied, the incidence of one root or four roots is very rare and cannot be evaluated from case reports which support the results of the present study. Prevalence of MB2 in permanent maxillary first molar teeth of Himachal Pradesh population was found to be 65.16% which is supported by the study conducted by Gupta Vishesh et al19 in 2016, they reported the occurrence of 69.2%. Heeresh Shetty et al15 also reported the prevalence of MB2 in South Indian population to be 86.36%, also Kishore Gopalakrishna Naik et al (2016)22 by clearing method found 84% MB2, the higher incidence can be due to regional difference between north Indian and south Indian population. Wasti et al reported (2001)23 found the presence of 53% four root canals in three rooted 30 maxillary molars of South Asian Pakistani’s by tooth clearing. Alavi et al(2002)17 reported incidence of 65% two root canals in mesiobuccal root of indigenous Thai population. The two separate canals till the apex 2-2 Vertucci’s Class IV had the second largest prevalence 19% after Vertucci’s Class I 34.84%
IX. CONCLUSION

The result of our study concludes that the incidence of two or more canals in permanent maxillary first molars of Himachal Pradesh (India) population is about 65%. Keeping in view this higher prevalence of the second canal the clinicians should always rule out the presence of mesiobuccal II canal. The presence of separate apical foramen in more than 48% cases necessitates that the MB II canal should not be left untreated to avoid failure of the endodontic treatment. The second mesiobuccal canal found in most of the cases was thinner and had tortuous course with intercanal communications and lateral canals so the role of thorough irrigation protocol is necessary. Further more studies are required to demystify the maxillary molar teeth for a better understanding of the tooth morphology and get best results for its root canal treatments. e MB2 canal.

REFERENCES


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