Journal of Applied Dental and Medical Sciences
NLM ID: 101671413 ISSN:2454-2288
Volume 2 Issue 2 April - June 2016

Review Article

Bewildering Mandibular Premolars

Sheetal Agnihotri [1], Ravjot Ahuja[2], Dax Abraham[3], Arundeep Singh[4]

[1]Post Gradaute Student, Manav Rachna Dental College,Faridabad
2Reader,Manav Rachna Dental College,Faridabad
[3] Professor,Manav Rachna Dental College,Faridabad
[4] Head of the Department & Principal,Manav Rachna Dental College,Faridabad

ARTICLE INFO

Keywords:
Topical anaesthetics, Lignocaine, Numeric Pain Scale, Pain Faces Scale, Sound Eye Motor Scale

ABSTRACT

A clear understanding of the anatomy of human teeth is an essential prerequisite to all dental procedures especially so in the case of root canal treatment which deals with management of the tooth's internal anatomy. A clinician must be aware of various paths that a root canal can take to the apex. Pulp canal system is complex and the canals may branch, divide and rejoin. External morphologic features that can be seen in teeth are crown size, root length, and division of roots. Internal anatomic variations occur in root canal configuration. Complex root canal system with atypical variations is a common finding among mandibular premolars. Endodontic treatment in these teeth may not be successful due to the failure to recognise and treat multiple canals Failure to recognize all these anatomical complexities often result in treatment failure.

Introduction

An exhaustive search was undertaken to identify published literature related to root anatomy and root canal morphology of the permanent mandibular premolars .

A clear understanding of the anatomy of human teeth is an essential prerequisite to all dental procedures especially so in the case of root canal treatment which deals with management of the tooth's internal anatomy.

Development of root begins after the enamel and dentin formation has reached the future cementoenamel junction. Epithelial cells of the inner and outer dental epithelium proliferate from the cervical loop of the enamel organ to form the Hertwig's epithelial root sheath. The root sheath determines if a tooth has single or multiple roots, is short or long, or is curved or straight.[2]

The epithelial rests appear as small clusters of epithelial cells which are located in the periodontal ligament adjacent to the surface ofcementum. They are cellular residues of the embryonic structureknown as Hertwig's epithelial root sheath.

Secondary apical foramen form as a result of two or three tongues of epithelium growing inward toward each other resulting in multirootedteeth.[2]

The pulp space is complex; root canals may divide and rejoin, and possess forms that are considerably more involved than commonly implied. Many roots have additional canals and a variety of canal configurations.

*Corresponding author: **Dr Sheetal Agnihotri, Mailing address;82, Godavari apartments ,Alaknanda ,New Delhi 110019., Email;sheetalkochhar@hotmail.com**

In the simplest form, each root has a single canal and a single apical foramen **(Type I)**. Commonly, however, other canal complexities are present and exit the root as one, two, or more apical canals **(Types II–VIII).**[3]

Successful endodontic treatment begins with a thorough knowledge of basic root and root canal morphology as well as anatomy of root canal system [1,4].

The **radicular groove** or the **radicular depression** is a "morphological defect found in teeth and has been reported as a predisposing factor for periodontal disease".

Developmental depressions or grooves are frequently found on both the mesial and the distal surfaces of the root resulting in an ovoid- or hourglass-shaped root. The depression on the distal root surface has been described as being deeper than the mesial root depression. Scott and turner describe the accessory root as " **Tome's root**".

The mandibular premolar is among the most difficult teeth to treat endodontically, as it has extreme variations in root canal morphology that occur in these teeth. Furthermore, the incidence,location, and morphology of root canal systems may vary in different ethnic or regional populations.

The mandibular first and second premolar is typically described as a single rooted tooth with a single rootcanal system.[7]A thorough knowledge of the basic root canal anatomy and its possible variations is essential for achieving successful nonsurgical endodontic treatment. Investigators have reported multiple foramina, fins, deltas, loops, furcations, and accessory canals in most teeth . The main reasons of endodontic failures are apical percolation and the presence of microorganisms caused by incomplete cleaning, insufficient canal obturation, and presence of untreated canals .

However they could be the most challenging to treat due to the failure to identify the complex variations in their root canal morphology. The ovoid shaped root in cross section normally has developmental grooves or depressions on the mesial and distal surfaces .

The mandibular first premolar is typically a single-rooted tooth that is wider buccolingually and narrower mesiodistally, although two-rooted varieties do occur fairly frequently. The overall average length of the mandibular first premolar is 22.5mm with an average crown length of 8.5 mm and an average root length of 14mm.[11]

Anomalous root and root canal morphology can be found associated with any tooth with varying degrees and incidence. Both the mandibular first and second premolars mostoften have a single root and a single canal, however, anomalies of the root and root canalsystems as well as multiple canals have been reported in the literature (Baisden et al.1992, Robinson et al. 2002).Mandibular first premolars are considered an endodontist'senigma.[5]

Root canal anatomy of mandibular second premolar can be highly complex. Amongst all the teeth, mandibular first premolar is quite difficult to treat, and has high flare up and failure rates, the major contributory factor is attributed to the variations in root canal anatomy[10.] An important aid for locating root canals is the dental operating microscope (DOM), which was introduced into endodontics to provide enhanced lighting and visibility. The DOM enhances the clinician's ability to remove dentin with great precision, thereby minimizing procedural errors and also significantly improves the clinician's ability to locate and negotiate canals. Most clinicians agree that the DOM makes canals easier to locate by magnifying and illuminating the grooves in the pupal floor and by

distinguishing the color differences of the dentin of the floor and walls[4].

A wide variety and complexity of root canal systems was first reported by Hess in 1925.Accessory canals, intercanal communication, apical delta, multiple canals were commonly identified. Variation in root canal morphology is now considered normal and the major cause of endodontic failure results from the inability to locate, debride, shape, and obturate all canals of the root system in three dimensions[8].

The root canal system varies with the race and gender[9]. Asian populations present one of the widest variations in coronal shape, external root form and internal canal space morphology.[10]

Amongst all the teeth, mandibular first premolar is quite difficult to treat, and has high flare up and failure rates, the major contributory factor is attributed to the variations in root canal anatomy[10].

Variations and Anomalies associated with mandibular premolars include germination, dens evagination, dens invaginatus, two roots, three roots, two canals in a single root, three canals with fused roots, three canals in a single root, three canals and two roots, three canals and three roots, three canals.[11]

A number of techniques have been used to study the morphologic characteristics of the root canal system. Traditional methods such as radiography, cross sectioning, staining and root clearing, scanning electron microscopy and stereomicroscopy are either destructive or provide only two-dimensional information[8]

Discussion

Slowey felt that mandibular premolars were the most difficult teeth to treat endodontically because of their aberrant anatomy . A complete awareness of their statistical data is important for the clinician to achieve a higher degree of success in endodontic treatment.

Studies have reported that the incidence of two or more canals in mandibular second premolar may vary between 1.2% and 34% . Sert and Bayirli have reported an incidence of 0.4% of mandibular second premolars with three root canals . Vertucci assessed the root canal morphology in 100 Turkish male and 100 Turkish female patients . Men (43%) exhibited two or more canals much more frequently than the female patients (15%) in the study. Vertucci reported an incidence of 2.5% of two separate and distinct root canals in mandibular second premolars; however he has not reported any case of mandibular second premolar with three root canals .

Mandibular second premolars mostly have a single root. The incidence of 2 or more roots is low, approximately 0.4%, whereas in mandibular first premolar it is 2.1%. Majority of the mandibular premolars have a single canal, but approximately 9% have 2 or more canals. A single apical foramen might be found in mandibular teeth in more than 9 out of ten cases, but 2 or more foramina may occur approximately 8.2% of the time. The incidence of more than 1 root, more than 1 canal, and more than 1 foramen is less frequent in the mandibular second premolar than in the mandibular first premolar.

Albuquerque et al. reviewed the management of variable anatomy in mandibular premolars. They emphasized the importance of understanding of normal anatomy and common variations, careful interpretation of angled radiographs, use of three-dimensional imaging, proper access cavity preparation, and a detailed exploration of the interior of the tooth, ideally under magnification.

Numerous methods have been used for studying root canal anatomy, including replication techniques, ground sections, clearing techniques and radiography. Advanced modes of radiographic imaging and analysis have allowed for in-depth knowledge of pulp space anatomy in three dimensions and allowed for identification of rare aberrations. These methods include spiral computed tomography (SCT), micro-computed tomography (micro CT) and cone beam computed tomography (CBCT) .

Ex vivo anatomic investigations, although the most widely used , inherently have certain shortcomings . it involves evaluation of extracted teeth that are frequently difficult to collect in sufficient numbers along with know specifics like age, gender , and so forth . furthermore most extracted teeth collected are severely damaged leading to difficulties in determining accurately the tooth notation .

Conclusion

Successful endodontic treatment requires a detailed knowledge of root canal anatomy. The presence of extra canals should be thought of in every tooth undergoing endodontic treatment. This would help in reducing endodontic failure due to incomplete obturation.

REFERENCES

1.Orban's oral histology and embryology. Eleventh edition,MOSBY St. Louis.

2. Avery J.K, Steele P.F, Essentials of oral histology and embryology:A clinical approach. 2nd Edn.C.V. Mosby, 2000.

3. Kottoor J, Albuquerque D, Velmurugan N, Kuruvilla J. Root anatomy and root canal configuration of human permanent mandibular premolars: A systematic review. Anatomy Research International 2013:1-14.

4. Cohen S, Burns RC, Pathways of pulp. 10th Edn. St. Louis: The CV Mosby Company, 2006.

5. Iyer VH, Indira R, Ramachandran S, Srinivasan MR. Anatomical Variations of Mandibular Premolars in Chennai Population. Indian J Dent Res 2006;17:7-10.

6. Pecora JD, Cruzfilho AN. Study of the incidence of radicular grooves in maxillary incisors. Braz Dent J 1992;3:11-16.

7. Algarni YA. Morphological variations in the root canal system of mandibular Premolars : A case series. J Am Sci2014;10(12):157-162.

8. Liu N, Li X, Liu N, Ye L, An J, Nie X, Liu L, Deng M. A micro-computed tomography study of the root canal morphology of the mandibular first premolar in a population from southwestern china.Clin Oral Invest 2013;17:999-1007.

9. Velmurugan N, Sandhya R. Root canal morphology of mandibular first premolars in an Indian population: a laboratory study. IntEndod J 2009;42:54-58.

10. Jain A, Bahuguna R. Root canal morphology of mandibular first premolar in a gujarati population- an in vitro study. Dent Res J 2011;8(3):118-122.

11. Ingle I.J., Leif K.B. Endodontics 6th edition, William and Wikins, 2000.

12.Nattress BR, Martin DM. Predictability of Radiographic Diagnosis of Variations in Root Canal Anatomy in Mandibular Incisor and Premolar Teeth. IntEndod J 1991;24:

Source of support: Nil Conflict of Interest: None

Online available at: www.joadms.org