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Endodontic Treatment of Mandibular Second Premolar with aberrant canal morphology: Achtung!

Payal Agarwal[1], Shagun Garg[2]

[1]Consultant Dental Surgery, Department of Oral, Dental & Craniofacial Care, Yashoda Super Specialty Hospital, Kaushambi, Ghaziabad Uttar Pradesh, India, [2]Assistant Professor, Department of Conservative Dentistry and Endodontics, D. Y Patil School of Dentistry, Navi Mumbai, Maharashtra, India

Abstract

Endodontic treatment poses day to day challenges to the clinician due to the incidence of aberrant root canal morphology. Mandibular second premolars are considered one of the most difficult teeth to treat for the same reason which is often associated with high chances of missed and untreated canals. Thus a thorough understanding of the anatomy of the root canal system especially of mandibular second premolars, is extremely important when performing cleaning and shaping procedures. This article focuses on the variations in root canal anatomy of mandibular second premolars treated successfully by conventional endodontic technique.

Keywords: *Endodontic, Aberrant, Root Canals.*

Introduction

A thorough understanding of root canal anatomy is essential for a long term successful endodontic treatment. One of the major reasons for failure of root canal treatment is missed canals. Although aberrant root canal morphology can be found associated with any tooth with varying degrees and incidence, mandibular second premolars have earned the reputation for having aberrant anatomy. Mandibular second premolars most often have a single root and a single canal, however, anomalies of the root and root canal systems as well as multiple canals have been reported in the literature[1,2]. Studies reported by Hess[4], Kerekes & Tronstad[5], Mueller[6], Pineda & Kuttler[7], and Vertucci[8], dealing with the number and form of roots and root canals of mandibular second premolars have revealed that in most instances they have only one root canal, although teeth with two or more root canals do exist. The incidence of a mandibular second premolar having additional canals is still rare[3]. In the literature approximately 98% of the mandibular second premolar teeth are single rooted while 1.8% teeth had two roots. Three roots were found in less than 0.2% of the teeth studied. Four roots were rare and found in less than 0.1% of the teeth studied. Vertucci[8] in his series reported 2.5% incidence of a second canal while Zilich and Dawson reported 11.7% occurrence of two canals and 0.4% of three canals. According to Ingle, mandibular second premolars have only 12% chance of a second canal, 0.4% of a third canal and Harty has reported 11% possibility of second canal[9,10,11,12]. This article focuses on the variations in root canal anatomy of mandibular second premolar and attempts at explaining their successful endodontic management using conventional endodontic techniques.

Corresponding author:
Payal Agarwal
Consultant Dental Surgery
Department of Oral, Dental & Craniofacial Care
Yashoda Super Specialty Hospital, Kaushambi,
Ghaziabad Uttar Pradesh, India
Contact No. + 91 970 456 0356
Email – drpayalag@yahoo.com

Case Report 1

A 34 years old male patient reported to our unit with the chief complaint of on and off pain in lower right back teeth region past many days. On clinical examination, lower right mandibular second premolar (45) had disto-proximal caries and was tender to percussion. On pulp vitality test a delayed response was observed. Pre-operative IOPA radiograph revealed signs of pulp

involvement (**Fig. 1**). Patient was advised to undergo root canal treatment for the same. Access opening was done in relation to 45 under local anaesthesia (2% Lidocaine HCl with 1:80,000 Adrenaline) and canals were located during which it was found to be an aberrant root canal configuration, 2 canals were located in the pulp chamber out of which 1 got divided into 2 branches and altogether 3 canals exit as 1 at the apex (**Fig. 2**). Working length was determined using apex locator followed by cleaning and shaping which was carried out by crown down technique using Rotary Protaper Files (Gold) up to F1. All the root canals were irrigated using 3% warm sodium hypochlorite solution, dried with sterile paper points, calcium hydroxide dressing was given and access cavity was closed using Glass Ionomer cement. At the second appointment as the tooth was asymptomatic the canals were thoroughly irrigated with saline and hypochlorite, obturated with corresponding F1 Protaper GP Points (**Fig. 3**) and post endodontic restoration was done.

Case Report 2

A 31 years old female patient reported to us with the chief complaint of mild aching pain in the lower left back teeth region past 1 week. On clinical examination, lower left mandibular second premolar was tender to percussion. Pulp vitality test was done in relation to 35 and no response was observed. Pre-operative radiograph showed no conclusive signs (**Fig. 4**). A diagnosis of non-vital tooth was made and root canal treatment was opted as the treatment of choice. Access opening was done in relation to 35 under local anaesthesia (2% Lidocaine HCl with 1:80,000 Adrenaline) and canals were located during which it was found to be an aberrant root canal configuration where out of 2 canals in the pulp chamber, 1 got divided into 3 branches and altogether 4 canals exit as 1 at the apex. working length was determined using apex locator **(Fig. 5**). Crown down technique was used for cleaning and shaping of canals using Rotary Protaper Files (Gold) up to F1. The root canals were flushed with 3% warm sodium hypochlorite solution, dried using sterile paper points and access cavity was closed with Glass Ionomer cement. At the subsequent appointment tooth was asymptomatic and the canals were obturated with F1 Protaper GP Points after thorough irrigation with saline and hypochlorite (**Fig. 6**). Post endodontic build-up was completed.

Fig. 1. Preoperative IOPA radiograph in relation to mandibular right second premolar

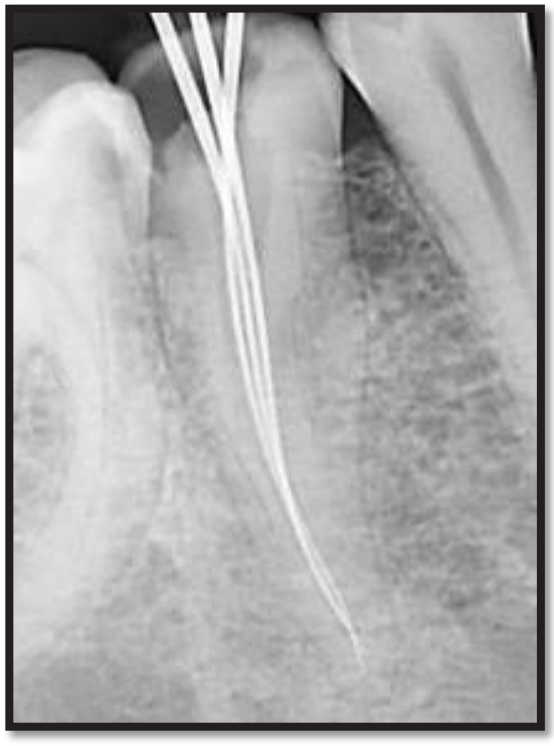

Fig. 2. Two canals located out of which one got divided into two branches and altogether three canals exit as one at apex

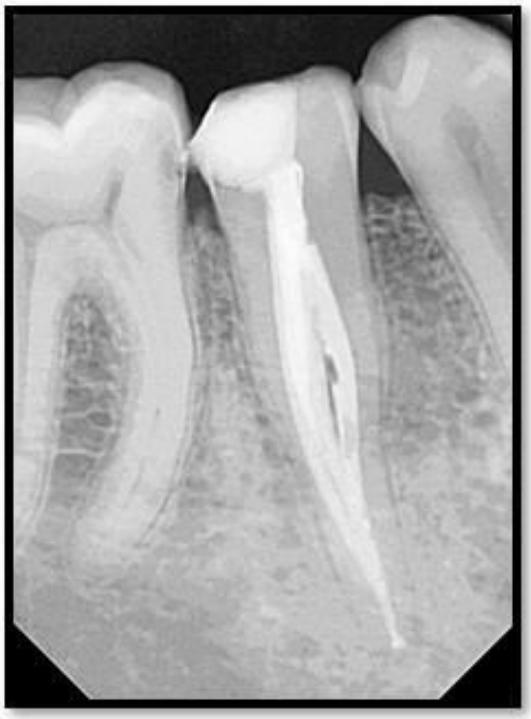

Fig. 3. Postoperative IOPA Radiograph in relation to mandibular right second premolar

Fig. 4. Preoperative IOPA Radiograph in relation to mandibular left second premolar

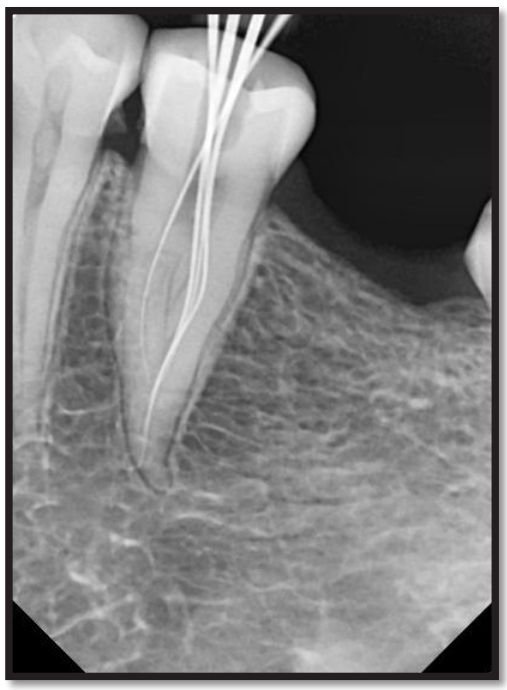

Fig. 5. Two canals located out of which one got divided into three branches and altogether four canals exit as one at apex

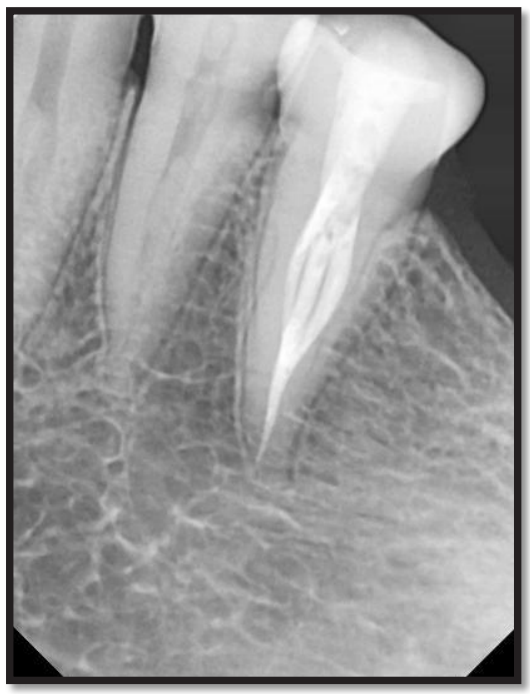

Fig. 6. Postoperative IOPA Radiograph in relation to mandibular left second premolar

Discussion

Unexplored supernumerary root canals which may harbour microorganisms have been reported to be one of the major cause for failure of endodontic treatment. Hence identification and management of these canals is of extreme importance for the clinicians. Possibility of aberrant root canal morphology especially in mandibular second premolars must be considered before taking them up for treatment. Lu *et al*. suggested that mandibular premolars are one of the most difficult teeth to treat endodontically and also the apical configuration of these teeth is complex[13]. Scott and Turner described the accessory root of mandibular premolar as Tome's root with its highest incidence (>25%) in Australian and Sub Saharan African population and lowest incidence (0-10%) in American, New Guinea, Jomon and Westren Eurasian population. Sert and Bayrili reported sex differences in canal morphology, reporting higher incidence (44%) of accessory roots and canals in females as compared to males (34%)[14]. Thus, a careful understanding of the root canal anatomy is of utmost importance for long-term successful management of such teeth.

In our patients, Case 1 was characterized by two canals leaving the pulp chamber wherein one canal got divided into 2 branches and later these three canals merge at the apex and exit as one canal. While in Case 2, the root system was characterized by 2 canals leaving the pulp chamber where one canal got divided into 3 branches and altogether these 4 canals merged at the apex and exit as one canal

Several methods have been worked upon and tested for the identification of two or more canals in mandibular premolars. Deviation of pulp chamber from normal configuration which seems to be either oval or triangular in shape[15], sudden narrowing of the main canal on a parallel radiograph, tactile examination of all the walls of the major canal with a small, precurved K-file, fibreoptic transillumination, magnifying loupes, surgical operating microscope and sodium hypochlorite bubbling in the extra canals are few of the common techniques which help in locating additional canals[16]. Successful endodontic outcome in such cases is dependent upon careful use of all the available diagnostic aids to explore and treat the entire root canal system.

Conclusion

Reports in the literature vary greatly with respect to aberrant root canal morphology of mandibular second premolars compared with the standard description of one root, one canal found in texts on Dental Anatomy. Aberrant root canal anatomy in mandibular second premolar teeth as described in this paper, occur in patients occasionally raises attention for the clinicians and may be reported in the literature. In the recent trends use of in vitro micro CT might be a promising tool in studying such variations that may occur in root canal anatomy and avoid endodontic failures.

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Conflict of Interest - NIL

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