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Successful Endodontic Management of Aberrant Mandibular Premolar Morphology- Report of 3 Cases

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Abstract

Mandibular premolars are one of the most challenging teeth to treat endodontically because of frequent aberrations in its root canal anatomy. The present article describes 3 case reports of mandibular premolars with morphological variations in the canal anatomy treated successfully by conventional non surgical endodontic treatment.

Keywords: Mandibular premolars, root canal treatment, root canal anatomy.

Introduction

Adequate knowledge of root canal anatomy and its variations is essential for successful diagnosis and subsequent endodontic treatment outcome [1]. According to Ingle, one of the most common causes for endodontic failure is incomplete canal instrumentation and obturation. Failure to diagnose the extra canals in the root canal system can often lead to flare ups during treatment and root canal treatment failure [2].

Mandibular premolars usually have a single root with a single canal but changes in canal configuration is not uncommon. Over the years, many reports of root canal morphological variations in mandibular premolars have been documented. Slowey, in 1979, indicated that mandibular premolars are the most difficult teeth to treat endodontically, because of frequent aberrant anatomy and due to this they are often referred to as “endodontists enigma” [3,4]. Vertucci, through his series of studies on mandibular premolars reported a 2.5% incidence of an extra canal [5].

The current case reports show successful diagnosis and endodontic management of multiple canals in mandibular premolars. While the first case report had two roots, the second case report had Vertucci Type V (1-2) and third case reported with Vertucci Type VI (2-1-2) canal configurations.

Case Reports

Case Number 1: 2 rooted mandibular premolar

A 22 year old female reported to Department of Conservative Dentistry and Endodontics, Manav Rachna Dental College, Faridabad, Haryana with a chief complaint of pain in lower right back tooth region. Patient described the pain as sharp, shooting and continuous in nature which subsided on taking analgesic medication. On clinical examination, deep caries were seen. Radiographic examination revealed radiolucency in the coronal portion of the tooth involving enamel, dentin and pulp. Based on the radiographic and clinical examination, the diagnosis of acute irreversible pulpitis with respect to #44 was made.

After explaining the treatment plan to the patient and obtaining patient's consent, treatment was started. Following administration of local anesthesia (LA), the tooth was isolated with a rubber dam. On access cavity preparation 2 canal orifices were located and working length was determined through an apex locator and confirmed radiographically. Radiograph revealed two roots with a single canal in each root. Cleaning and shaping of the canals was done with copious irrigation using 3% Sodium hypochlorite. The canals were prepared by rotary instrumentation and obturated using warm vertical compaction (Figure 1).

Case Number 2: Vertucci Type V

A 24 year old female reported to Department of Conservative Dentistry and Endodontics, Manav Rachna Dental College, Faridabad, Haryana with a chief complaint of pain and swelling in lower left back tooth region since 1 month. Patient gave a history of sharp, shooting and continuous pain. Clinical examination revealed deep occlusal caries with respect to tooth #35. Tooth was tender on percussion. The Intra Oral Periapical Radiograph (IOPA) revealed radiolucency in the periapical region of the tooth. It was decided to continue with the non surgical root canal treatment. Based on the examination, the diagnosis was made as periapical abscess.

After explaining the treatment plan to the patient and obtaining patient's consent, treatment was started. LA was administered and access preparation was done. Working length was determined by a combination of apex locator and IOPA. The radiograph revealed bifurcation of the canal in near the apical third of the root confirming Vertucci Type V configuration. Biomechanical preparation was done with copious irrigation using 3% Sodium hypochlorite. The canals were prepared by rotary instrumentation and obturated using warm vertical compaction (Figure 2).

Case Number 3: Vertucci Type VI

A 35 year old female reported to Department of Conservative Dentistry and Endodontics, Manav Rachna Dental College, Faridabad, Haryana with a chief complaint of pain in lower right back tooth region. The pain was described as sharp, shooting and continuous in nature. On clinical examination, deep proximal caries were seen. Radiographic examination revealed radiolucency in the distal coronal portion of the tooth involving enamel, dentin and pulp. Based on the radiographic and clinical examination, the diagnosis of acute irreversible pulpitis with respect to #44 was made.

After explaining the treatment plan to the patient and obtaining patient's consent, treatment was started. LA was administered and access preparation was done. Working length was determined by a combination of apex locator

and IOPA.On access preparation 2 orifices were located and the radiograph revealed 2 canals coming together as a single canal in the middle third root area and again bifurcating into 2 canals in the apical third area of the root. It was confirmed as Vertucci Type VI configuration. Biomechanical preparation was done with copious irrigation using 3% Sodium hypochlorite. The canals were prepared by rotary instrumentation and obturated using warm vertical compaction (Figure 3).

Discussion

The presence of extra roots or canals in mandibular premolars is an endodontic challenge. The challenge lies in diagnosing the variation from normal and its successful endodontic treatment. Proper and accurate interpretation of radiographs taken at different angulations, straight and angled, using paralleling technique are imperative for proper diagnosis of the number of roots and the canals that exist in the tooth. Careful tactile examination of the canal system using hand files along with proper attention to details like change in colour of the pulpal floor and wall is also helpful in locating the canal orifices [6,7].

Miyoshi *et al*, in 1977, gave a general guideline according to which, if the middle-root diameter appears equal or greater than the crown diameter in the preoperative radiograph, the tooth is more likely to have some variation in the canal configuration [8]. Yoshioka *et al*, indicated the sudden narrowing of the canal system on a parallel radiograph is suggestive of multiple canals [9].

A study by Hasheminia and Hashemi (2005) observed that broad and flat roots are more predisposed to contain multiple canals and intracanal ramifications. They found 11.2% of mandibular second premolars with 2 or more canals [10,11].

Various documented studies prove that mandibular premolars are possibly the most difficult teeth to treat endodontically due to varied root canal morphology. In a study by University of Washington to assess root cnal failure rate, mandibular premolars had the highest failure rate at 11.45% [12]. Ethnicity has a significant influence on aberrant anatomy. Two and three canal premolars are seen frequently in African and Australian populations [13,14]

This article describes a series of case reports with aberrant morphology of root canals of mandibular premolars and their successful endodontic management.

Conclusion

Successful endodontic treatment is influenced my multiple factors including thorough knowledge of biology, physiology, and root canal anatomy along with proper diagnosis and application of skills to complete the treatment. In cases with aberrant morphology, proper diagnostic aids and modification of access preparation are important for successful management.

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Figure Legends

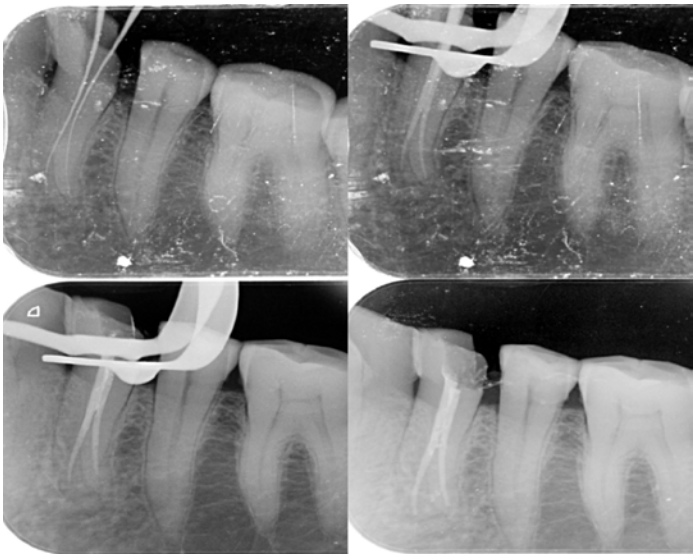

Figure 1: Management of mandibular right premolar with 2 roots.

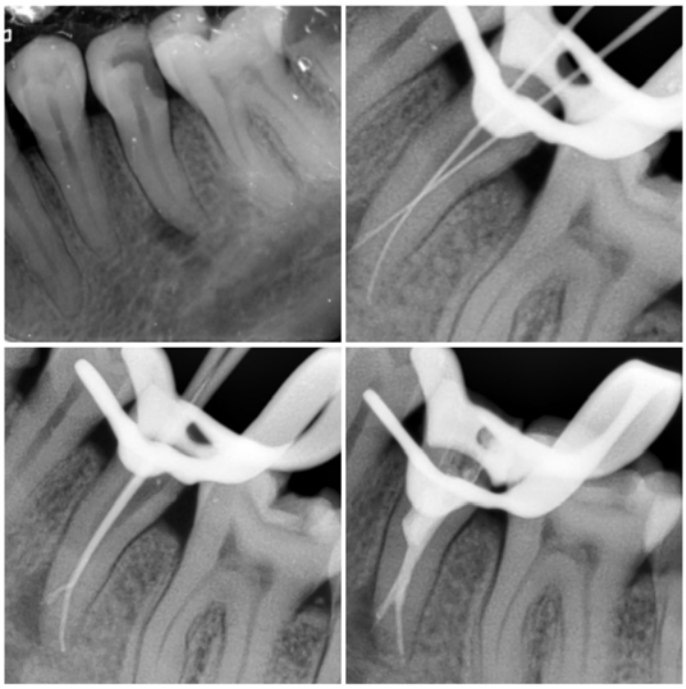

Figure 2: Management of mandibular left premolar with Vertucci type V configuration.

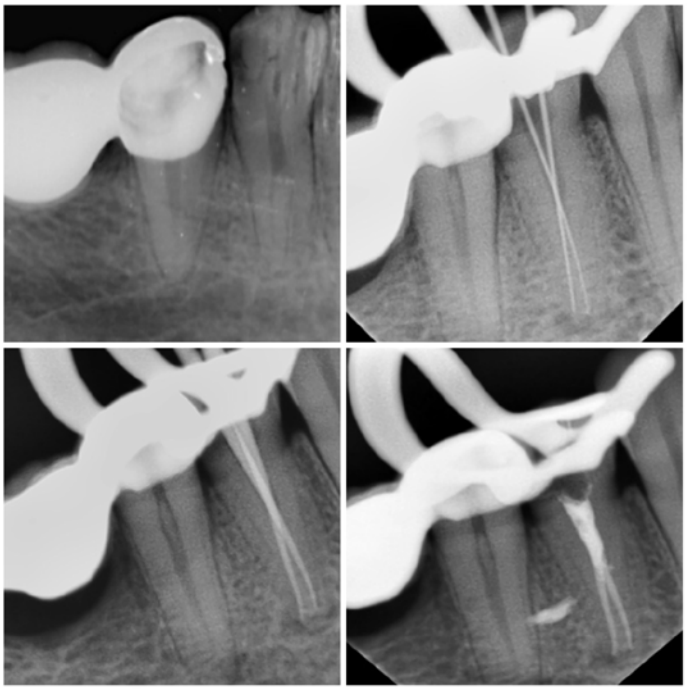

Figure 3: Management of mandibular right premolar with Vertucci type VI configuration.