

**Mandibular second premolar with Vertucci Type II root canal morphological system: a case report**

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**Abstract**

Abstract Proper access cavity preparation, enough cleaning, proper shape, and full obturation are necessary for a root canal to be successful. The placement of each canal in the tooth is crucial to the first therapeutic steps that follow. Although the morphology of most teeth is typical, we should acknowledge that there are some variances. Mandibular premolars are among the hardest teeth to treat endodontically since various anatomical abnormalities have been documented in them. A mandibular second premolar with two root canals and one apical foramen (Vertucci Type II) underwent endodontic treatment was the subject of this case study. The primary complaint of a 13-year-old girl was discomfort in her right mandibular second premolar. Even after a pain was removed, the discomfort persisted for some minutes and kept awake her from sleeping and lingered for several minutes even after removal of a thermal stimulus. Upon clinical examination, the tooth was found to be sensitive to percussion. After making a clinical diagnosis of apical periodontitis and irreversible pulpitis, root canal treatment was carried out in accordance with accepted procedures. Even though mandibular premolars seldom have one root and two canals, the clinician should constantly be aware of differences in the number of roots and canals in order to properly handle such situations.

**Keywords:** Mandibular premolar; one root; root canal treatment; two canals; Vertucci Type II root canal.

**INTRODUCTION**

A key and useful strategy for sustaining and protecting oral health is now successful endodontic therapy. Essential components of endodontic therapy include a precise interpretation of preoperative radiographs and a complete grasp of the architecture of the root canal. It can be challenging to discover variations in the form of aberrant canal configurations, auxiliary canals, bifurcation, isthmuses, and anastomoses, which makes endodontic treatment challenging.[1] Irritation might persist if an additional canal is not identified and treated, which would jeopardize the root canal therapy's long-term efficacy.[2] Eight types of morphological patterns for root canal systems have been identified by Vertucci [3,4] (2005). Each root contains a single canal and a single apical foramen (Type I) in its most basic form. However, additional canal difficulties are often exist and emerge as one, two, or more apical canals (Types II–VIII) from the root. [3,4] The mandibular second premolars (Vertucci Type I; 99.28% and 86.9%, respectively) typically have a single root and a single canal.[5] On the other hand, Vertucci Type II—two root canals with a single apical foramen—occurs in only 7–9% of mandibular second premolars.[6,7] The goal of this case study was to demonstrate the effective treatment of a mandibular second premolar with two root canals and one apical foramen (Vertucci Type II), an uncommon anatomical variant.

**Case report**

A 25-year-old girl presented herself to the Rama dental college, Department of Conservative dentistry and Endodontics, mostly complaining of discomfort in the right mandibular area. She was sleeping when the sudden discomfort during the history taking occurred. Chewing

food is aggravated by the discomfort. A deep disto-occlusal carious lesion was discovered during an intraoral examination of the right mandibular second premolar. Upon clinical examination, a deep carious lesion measuring around 45 was found, and the tooth exhibited pain to percussion. When comparing the pulp test results from the electric pulp tester to the contralateral teeth, the electric pulp tester revealed an inflated reaction, and the cold pulp test revealed persistent discomfort. It was discovered that there were no periradicular lesions connected to the tooth (Fig. 1a). a clinical finding indicating apical periodontitis and permanent pulpitis was made. Root canal treatment was decided and explained to the patient. CT could not be planned.

The treatment was initiated with local anesthesia, inferior alveolar nerve block on the right side of jaw using 40 mg/mL articaine hydrochloride with 0.012 mg/mL epinephrine hydrochloride. After local anesthesia and rubber dam isolation, straight-line access was gained to the pulp chamber. Two root canals were located, one in the buccal and one in the lingual. The working lengths of the root canals were determined by using Raypex 6 (VDW, Munich, Germany) apex locator, and checked with a radiograph, which revealed two canals with one apical foramen (Fig. 1b). Cleaning and shaping was performed using a crown-down technique with Revo S files (Micro- Mega, Besançon, France) using 5% sodium hypochlorite irrigation. (# 40/.06 taper). Patency was achieved in the canals and was maintained with a 10 Kfile (DentsplyMaillefer, Ballaigues, Switzerland). Root canal filling was completed by using the cold lateral compaction method with AH Plus (Dentsply DeTrey, Konstanz, Germany) sealer and gutta-percha (Diadent Group International, Chungcheongbuk-do, Korea). The root canal treatment was completed in a single-visit appointment.

The tooth was later restored with composite resin (3M, St. Paul, MN, USA). A postoperative periapical radiograph showed complete filling of the two main canals (Fig. 1c). Following the completion of endodontic treatment of the right mandibular second premolar, the patient, who felt no obvious symptoms or signs.



**Fig. 1. (a)** Diagnostic radiograph showing two canals. **(b)** Working length radiograph. **(c)** Periapical radiograph following the canals.

### Discussion

The complex anatomy of the mandibular premolar should be thoroughly understood for proper management and a better prognosis.[8] Vertucci Type II root canal morphology in mandibular premolars has great clinical importance during endodontic treatment. These morphology, in which there are two canals with one apical foramina, poor or no filling of the lingual root canal may lead to failure of the endodontic therapy.[9] The clinician must be

recognize the anatomical morphology of a normal root canal system, as well as any variations that may exist. For this purpose, professionals must have a good knowledge of the internal anatomy of teeth and also know the radiographic techniques and their variations, in order to have a perfect visualization of root canals. Several studies regarding the anatomical variations in mandibular premolar teeth are available in the literature. [5,10,11] In mandibular second premolars, Vertucci Type I with single canal from orifice to apical foramen is the most prevalent canal type (90%).[5] Second premolars presented with a second canal in Iranian (5.8–17.5%)[6,12,13] or Jordanian

(22.8%)[14] populations. However, Mongoloid[15,16] and Hispanic[8] populations presented a much lower incidence of a second canal, 2% and 1.2%, respectively. The second-most-prevalent canal type of the mandibular second premolar was type II, according to the findings of Rahimi et al.[6] (7.9%, in Jordanian population), and Sikri and Sikri[7] (9%, in Indian population). Genetic and racial variations are factors that may affect root canal anatomy and morphology. In a Turkish sample, Sert and Bayirli[11] evaluated the proportion of different root canal types and authors reported that 7% of the mandibular second premolar teeth had Vertucci Type II root canal morphology. This case report demonstrated successful management of a mandibular second premolar with Vertucci Type II root canal morphology. Endodontic success in teeth with additional canals requires a meticulous clinical and radiographic examination. Angled preoperative radiographs, cone beam computed tomography images (CBCT), examination of the pulp-chamber floor with a sharp explorer, troughing of the grooves with ultrasonic tips, staining the chamber floor with 1% methylene blue dye, performing the sodium hypochlorite “champagne bubble test,” and visualizing canal bleeding points are all essential aids in locating the root canal orifices.[17] The search for additional orifices is

also abetted by the use of microscopes, magnifying loupes, and fiber-optic transillumination to locate the developmentalline between the mesiobuccal and mesiolingual orifices.[18] In the present case, as we were able to observe two canals by a standard periapical radiograph (20° angulation from mesial and distal side), we did not need to take CBCT.

In the present study, the shape of access cavity was ovoid in buccolingual direction. We negotiated and secured canals with small-sized hand files. Once the canal was manually reproduced, a dedicated mechanical glide path file was used to expand the working width and preshape a canal in preparation for shaping procedures. Then, both buccal and lingual canals were prepared with Ni-Ti rotary files (# 40/.06). The clinician should be careful in instrumentation of such canals, as overzealous instrumentation can lead to strip or lateral perforations in these critical areas.

Mandibular premolars, because of their complex canal systems, are often considered the most difficult of all teeth on which to perform successful endodontic treatment. [11,19] However, various innovations in diagnostics, magnification, operative instruments, and techniques and an updated knowledge with regard to the anatomy of mandibular premolars could certainly improve the endodontic success rates of even the most challenging cases.

## Conclusion

The present case report proved the importance of knowledge of root canal system and the most common variations one must keep in his/her mind before starting an endodontic treatment of mandibular premolar teeth.

**Conflict of interest:** None declared.

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