Case Report

A Rare Case Of Mandibular Second Molar Characterized By A Single Canal - A Case Report

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Abstract

Mandibular second molars with a single root canal present a distinctive anatomical variation. This case report aims to present a rare morphological variation of mandibular second molar characterized by a single canal diagnosed with a peri-apical radiograph and orthopantomogram. A 43-year-old Saudi Arabian woman was referred to the dental clinic complaining of discomfort and pain while chewing on the right back region of her mouth. A fixed partial denture was noted on clinical examination that spanned from the right mandibular second premolar (tooth #45) to the right mandibular second molar (tooth #47).The right mandibular second molar (tooth #47) had no mobility but was sensitive to percussion. The periapical radiograph revealed the existence of one root canal with apical radiolucency associated with this tooth. The final diagnosis of the tooth under consideration was pulpal necrosis with symptomatic apical periodontitis. This case confirms the presence of a single root and root canal in a second mandibular molar. Root canal treatment was done for the symptomatic tooth. Furthermore, longitudinal follow-up of the treated tooth for four years after the root canal procedure, both clinically and radiographically demonstrated complete resolution of the peri-apical lesion. This case report unveils a unique and infrequent variation in the root canal system of a mandibular second molar: a single root associated with a single root canal. For optimal dental care management, clinicians must vigilantly acknowledge the potential for variations in the root canal systems of mandibular molars.

Keywords: Mandibular molar, Single-root, Single canal, Case report, Root canal treatment

Introduction

Root canal morphology in multi-rooted teeth can often show several variants, which can be a hindrance in proper diagnosis and appropriate endodontic management of the tooth. The root canal system is so complex that there could be branching, splitting, or rejoining of canals[1]. The clinician should be aware of the fact that there is a possibility of the tooth exhibiting fewer canals than usual to minimize errors. The variability in root canal anatomy not only complicates treatment planning but also underscores the importance of thorough pre-operative assessments, including precise imaging techniques and meticulous clinical examinations. As clinicians encounter diverse canal configurations, they must adapt their approach to deliver the highest standard of care.

Mandibular second molars are among the teeth that display racial and geographical variations in root and root canal morphology[2]. The discovery of these variations opens a fascinating window into the complexities and diversities of dental anatomy across and within populations.

The Saudi Arabian population exhibits considerable diversity, encompassing individuals from varied ethnic and geographical backgrounds who live and work within the country[3]. Consequently, it becomes imperative to report the existing morphological variations in roots and root canals to assist dental professionals employed in Saudi Arabia.

The common morphological variations observed to date in mandibular molars include several root canals, and differently shaped canals[4]. In mandibular molars with a single root, the distal canal configuration is frequently found to be a Vertucci type I. In contrast, the mesial canal configuration in single-rooted mandibular molars has been classified into Vertucci types I, II, IV, and V[s]. The absence of fusion of the vestibular or lingual side of Hertwig's root epithelial sheath is the cause of this variation in root growth[6]. Consequently, the presumption that all mandibular second molars possess two roots, and three canals should be reconsidered. This is an interesting case report of a mandibular second molar showing a single root and single root canal rather than three (Vertucci classification Type I). Single root morphology was observed only in the right second mandibular molar. In contrast, the left molar exhibited normal morphology of two roots with three canals, thus presenting a unique root canal morphology, this article seeks to detail the treatment approach for the atypical structure of a mandibular first molar with a single root and single canal, a configuration yet to be documented in the endodontic literature.

Case Presentation

Patient information

A 43-year-old Saudi Arabian woman was referred to the dental clinic of Department of Restorative Dental Sciences, College of Dentistry, Majmaah University, Saudi Arabia. She complained of discomfort and pain while chewing on the right back region of her mouth. The patient was medically healthy and had no chronic illness nor any history of allergies or hospitalization. The patient reported that pain and discomfort in relation to this tooth began one month back,

and the pain intensity increased over the past few days. The patient had undergone several dental treatments in the past, such as scaling and root planning, extractions, root canals, and other restorations, without any complications.

Clinical findings

On clinical examination, a fixed partial denture was noted that spanned from the mandibular second premolar (tooth #45) to the mandibular second molar (tooth #47).Tooth #47showed no mobility but was sensitive to percussion. A refrigerant spray was used to conduct a pulp sensibility test a size #2 cotton pellet was placed on the contralateral tooth #37 to establish a baseline response in which sensation was felt and disappear immediately after removing the cotton pellet on the other hand when the cotton pellet was placed on tooth #47 no sensation was felt.

Diagnostic assessment

Radiographs were taken for further diagnostic assessment. This included a preoperative panoramic (Fig 1) and periapical radiograph (Fig 2). The periapical radiograph revealed the existence of one canal with apical radiolucency associated with tooth #47. This tooth was diagnosed with pulpal necrosis with symptomatic apical periodontitis.

Figure 1: The patient's panoramic radiograph reveals an asymmetry between the single-rooted tooth #47 and its contralateral counterpart, tooth #37, which has two separate roots.

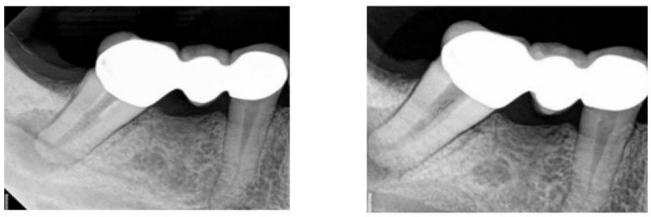

Figure 2: Before the procedure, the radiographic evaluation included (A) a Straight-on and (B) an Angled view, both of which displayed tooth #47 with a sizable pulp chamber housed within a singular conical root

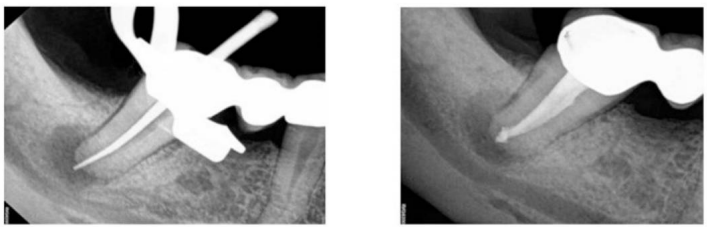

Figure 3: (c) Master gutta-percha cone radiograph. (D) Final radiograph showing dense obturation.

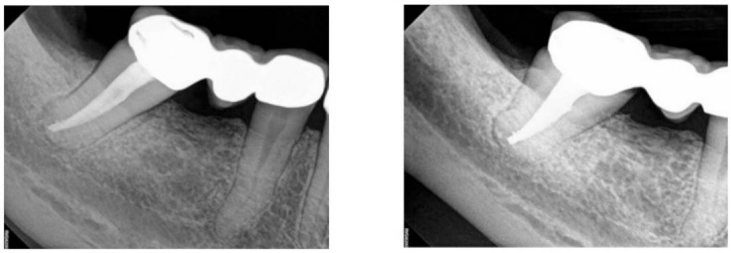

Figure 4: (E, F) Four-year post-operative radiograph

Therapeutic intervention

Either endodontic management or an extraction were the available treatment options for the patient. The patient chose endodontic management, and a consent form was obtained from the patient for the same. Root canal treatment was followed by a composite restoration that was planned for tooth #47. To do this procedure, a rubber dam was applied on this tooth. This was followed by crown disinfection with a tincture of iodine before the access opening. A cavity for access to root canal was prepared on the crown using a diamond fissure bur attached to a high-speed instrument, with continuous water spray and irrigation. The access cavity was further refined using microscopic examination, revealing a single, sizeable circular canal. A file (size 15 K) was placed in the canal and attached to an electronic apex locator (RPEX6 apex locator, Novo Dental Export, Guangdong, China) to obtain the working length, after which the length was confirmed radiographically. Instrumentation with profile rotary files was used to prepare the canal: (1) 25/0.06, (2) 30/0.06, (3) 35/0.06, and (4) 40/0.06. The procedure used sodium hypochlorite (5.25%) as the primary

rinsing solution during the procedure. Ethylenediaminetetraacetic acid and glyde were used as lubricants. Patency of the canal was confirmed during the procedure using a size 10 K file. A sterile paper point was used to dry the canal. A gutta-percha master cone size 40, taper 0.06, was then inserted, and its position was confirmed radiographically (Fig 3). Obturation was done using a continuous wave compaction technique (Fig 3). Endodontic sealer residues were removed using alcohol-soaked cotton pellets, and the access cavity was temporarily filled with temporary restoration.

Follow up and treatment outcome

The patient was followed up for four years. Post-operative radiograph (Fig 4) was taken. Complete healing of periapical radiolucency is observed at the end of the follow-up period.

Discussion:

This case report explores an unusual root canal morphology in a mandibular second molar, characterized by a single root and canal. The foundation of a successful root canal treatment is rooted in meticulously planned access preparation[7]

Typically, mandibular second molars have two roots: the mesial root usually contains two canals, while the distal root has a single canal[8]. However, these teeth can exhibit considerable anatomical changes, such as one root, three mesial root canals, two distal roots, extra roots, or taurodontism[9]. Finding every root canal and filling it correctly improves the effectiveness of the treatment[10].

Saber et al. investigated the root canal configuration of mandibular second molars in an Egyptian cohort using cone beam computed tomography. They discovered that only 3.2% exhibited a singular canal. This suggests that mandibular molars with only one root canal are also infrequently found in the Egyptian population[11] . The non-C-shaped molars showed a presence of 16.2% of single root in the above study, and the tooth under consideration in our case report was also non-C-shaped. There is possibly little difference in the pattern of root and root canal morphology variations between the Saudi Arabian and Egyptian populations. This could be due to ethnic similarities between the Middle Eastern and African populations.

In the study done by Mantovani et al., 2022[12], the Brazilian subpopulation considered in the study displayed a high incidence of bilateral symmetry in the root and root canal morphology, which is in contrast to our case report where only the right molar showed a distinct morphological feature.The occurrence of a single root in mandibular second molars was observed to be 4.88% in males and 9.74% in females. The study observed a lower incidence of mandibular molars with a single root. Of the mandibular second molars, which showed a single root, about 4.91% had a C- shaped canal. Among them, only 2.08% had type I root canal configuration. Hence, further studies in the Saudi Arabian population are thus needed to attribute the divergence of results to ethnic differences, as our case report has observed several differences in the internal anatomical characteristics of the mandibular second molar compared to the Brazilian subpopulation.

A study done by Senan et al in 2021 from the

neighbouring region of Yemen among the population using CBCT revealed that only 0.8% of the study participants had a single root in mandibular second molars. C-shaped canals and bilateral symmetry were other prominent findings in the population[13]. Since Yemen is geographically close to Saudi Arabia and ethnically similar as well, the findings of this study hold importance for the Saudi population. However, our case report did not observe a C-shaped canal and bilateral symmetry as observed in the study among the Yemeni population.

In a systematic review of studies done in the Saudi Arabian population by Mashyakhy et al recently, only 2 out of 338 mandibular second molars showed a single root[14]. The review involved studies on the permanent mandibular dentition of the Arab population.

Tie strengths of this particular case report include using panoramic and periapical radiographs to assess the canal configuration of the mandibular right second molar of the patient. The aid of microscopic visualization was utilized as well.

This case report implies the need to use non-invasive technologies such as CBCT and micro-CT scans for early recognition of morphological variations and better treatment delivery before endodontic management of mandibular second molars. Separate assessment of both mandibular second molars is also necessary while planning for endodontic management. However, unilateral single-root presentation of cases of mandibular second molars is rare among the Arab population.

Conclusion:

This case report reveals an uncommon and rare deviation in the root canal configuration of a mandibular second molar, characterized by a singular root linked to a single root canal. For optimal dental care management, clinicians must vigilantly acknowledge the potential for variations in the root canal systems of mandibular molars.

Case reports like this not only facilitates the provision of enhanced endodontic therapies but also serves to bridge the prevalent knowledge gap in the field. Moreover, documenting these variations will be pivotal in creating a comprehensive database of root canal anatomies prevalent in the region, providing a valuable resource for research and education in dental sciences. Additionally, understanding the spectrum of anatomical diversities can pave the way for developing specialized tools and techniques that might cater specifically to the unique challenges posed by these variations.

Conflict of interest

Nil

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