

Clinical Management of a Mandibular Second Molar with Three Mesial Canals: A Case Study

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Authors' contributions

This work was carried out in collaboration between both authors. Author LH designed the study and finished the therapy. Author CW wrote the first draft of the manuscript and managed the literature searches. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJCRMH/2018/41412

Editor(s):

(1) Khadiga Ahmed Ismail Eitris, Professor, Department of Parasitology, Faculty of Medicine, Ain Shams University, Cairo, Egypt.

Reviewers:

(1) K. Srinivasan, Dr. NTR University of Health Sciences, India.

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Complete Peer review History: <http://www.sciencedomain.org/review-history/24518>

Case Report

Received 24th February 2018

Accepted 2nd May 2018

Published 8th May 2018

ABSTRACT

Most mandibular second molar has two canals in mesial root and one in distal. This report represents a case of mandibular second molar with three mesial and two distal root canals. To achieve the ideal goal of endodontic treatment, clinicians should be aware of the complicated configuration of the root canal system and use suitable methods to identify the accessory canals that exist possibly.

Keywords: Mandibular second molar; root canal treatment; the third mesial canal; dental operating microscope (DOM); cone-beam computed tomography (CBCT).

1. INTRODUCTION

To achieve a successful root canal treatment, accomplishing detection, cleaning, shaping and complete obturation to the entire canal system is

of most importance. Thus, the anatomy of the root canals such as the root numbers, numbers of canals in each root and their types and shapes plays a key role in the success of endodontic treatment.

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Variations in the canals of the mandibular second molar have been reported by a number of investigators. It is described that the root and canal morphology is different according to the race and genetic [1]. The most common morphology was the presence of two canals in the mesial root and one in the distal root of the teeth with separate roots [2,3]. Otherwise, mandibular second molar commonly have fused roots and there was a high prevalence of C-shaped canals in Chinese population (39%-45.5%) [2,4,5,6]. In addition, there were other types such as 2 roots and 2 canals, 2 roots and 4 canals, 3 roots and 3 canals, 3 roots and 4 canals, etc [7,8,9]. While the presence of a third canal in the mesial root of the mandibular second molar with 2 roots and 5 canals has been reported rarely, to have an incidence of 0%-16.7% [1,10,11]. Compared with distal root canals, the mesial root in mandibular molars is more complex than that was commonly considered [12]. Middle mesial canal has been a hot area of research for several years. It is reported that the differences in the distribution of middle mesial canals based on sex, ethnicity and molar types [13].

This report describes a case of a mandibular second molar with two roots and five canals three canals in the mesial root and two in the

distal root) and discusses the significance of treating such cases.

2. CASE REPORT

A 68-year-old female patient presented to the Department of Endodontics of the JiLin University with a history of recurring painful swelling for 2 years and with a fistula on the buccal side in the lower right molar area. Her medical history had no relevant contribution. Informed consent for publication of photographs has been obtained from the patient. The mandibular right second molar was tender on vertical percussion and have a gomphiasis at I degree. A radiograph revealed deep carious lesion in distal proximal area approximating the pulp space area of teeth#47 [Fig. 1]. A diagnosis of an chronic periapical periodontitis was made for the mandibular right second molar.

Local anesthesia (2% lidocaine with 1:40,000 adrenaline) was performed. The tooth was isolated by a rubber dam, all carious tissue was removed and then an adequate access cavity was prepared. DG-16 Endodontic explorer (Hu-Freidy, USA) located the extra-canal orifice under dental operating microscope (DOM).The CBCT scan demonstrated there are there canals in mesial root and two canals in distal root.



Fig. 1. Pre-operative radiograph

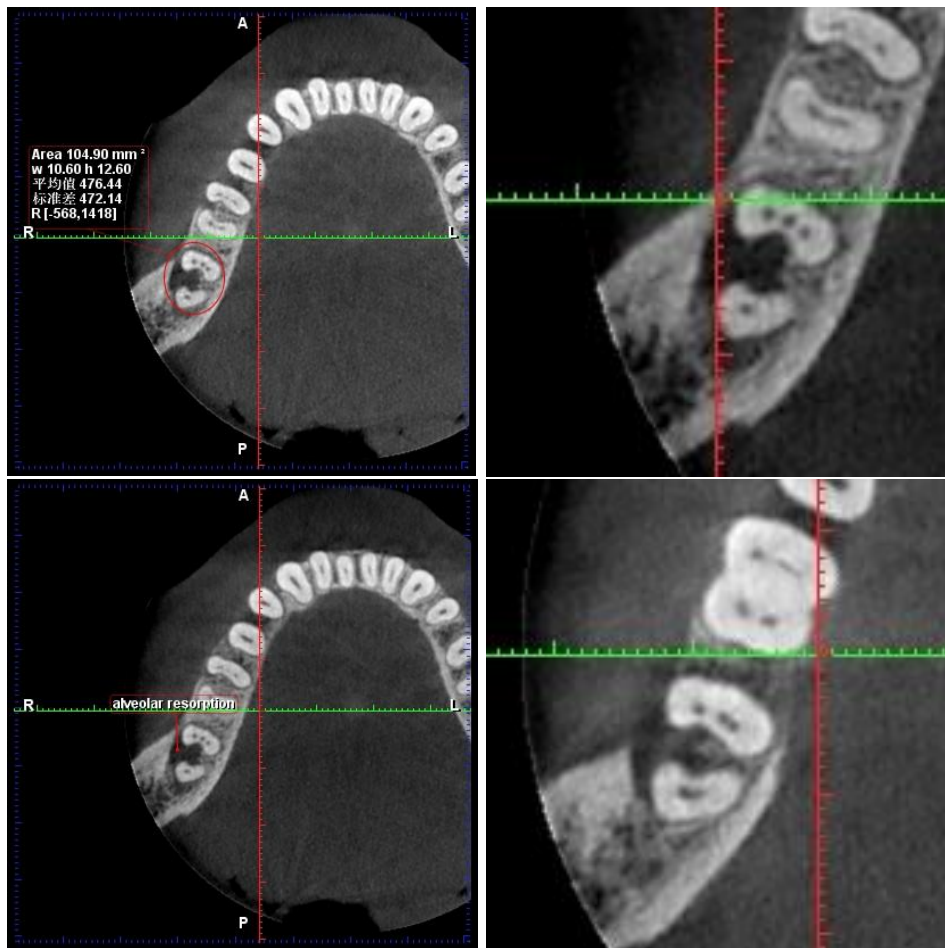


Fig. 2. Pre-operative CBCT

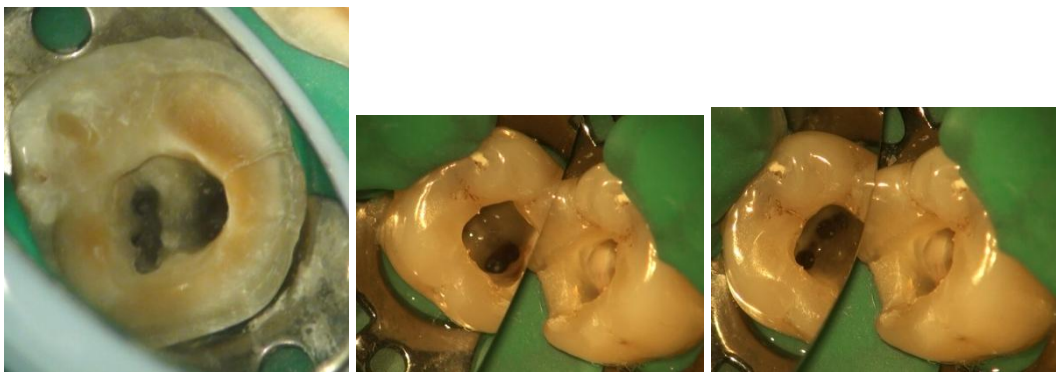


Fig. 3. Access opening

After canal identification and negotiation, the working length was determined by an electronic apex locator (Propex II, Dentsply Maillefer, Israel). All canals were cleaned and shaped with ProTaper NiTi rotary instruments (Dentsply-Maillefer, Ballaigues, Switzerland) under copious irrigation with 1% sodium hypochlorite and saline. Canals were dried with paper point and

temporized with calcium hydroxide (Pulpdent, USA).

At the second appointment after a week, all the canals were recapitulated, irrigated, dried and an angled radiograph was taken with master cones in all canals [Figs. 5 and 6]. The canals were obturated with continuous wave condensed gutta

percha (0.04 taper, Gapadent, China) and roeko sealer, and the access was closed with temporary restoration. A post-obturation angled radiograph was taken. The patient experienced

no postoperative sequelae and was scheduled for appropriate coronal restoration. The efficacy and prognosis will be observed by follow up.

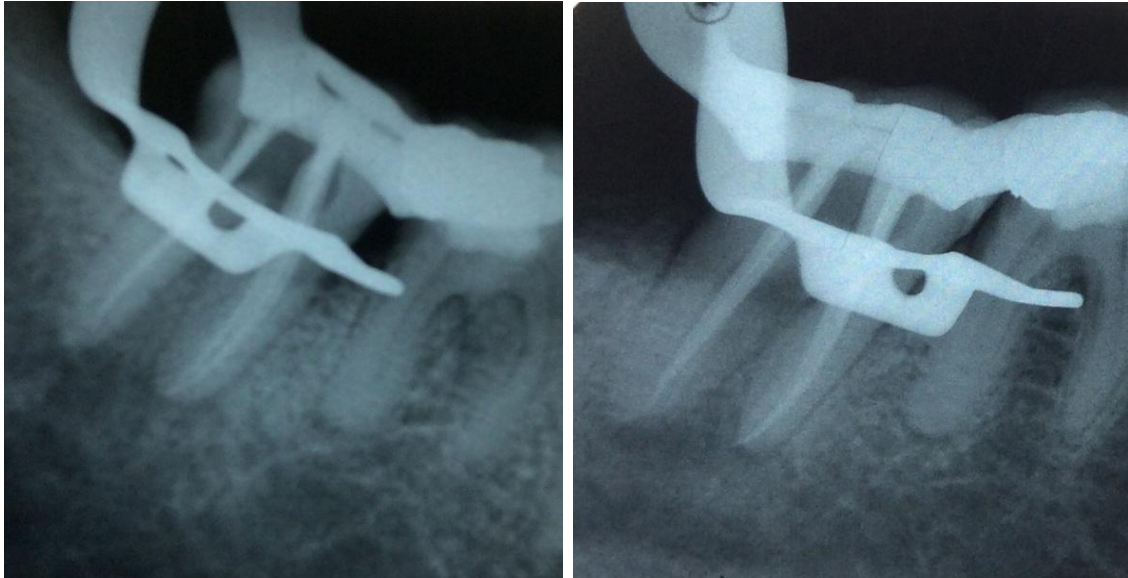


Fig. 4. Master cone in angled radiograph

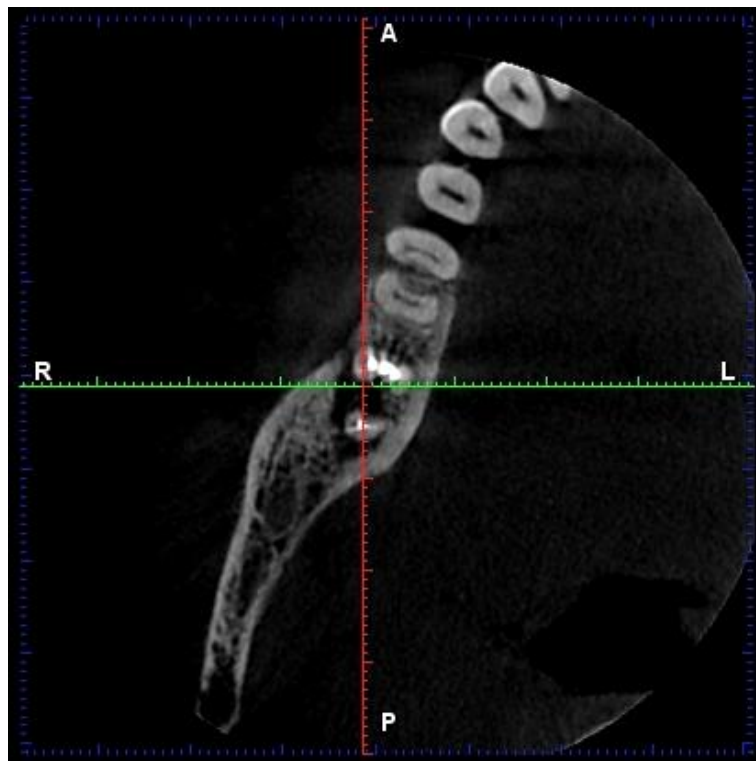


Fig. 5. CBCT after obturation



Fig. 6. Root canal orifice



Fig. 7. Obturation

3. DISCUSSION

One of the most common reason for the failure of endodontic treatment was missing canals, the bacteria might be located in such undetected or unprepared portion of the root canal, leading to the chronic symptoms and unhealed periapical lesions [14]. Just as this case, the complex nature of the root and root canal morphology of the mandibular second molars, especially the

mesial root, has been underestimated easily. There are studies report 7.52% of the orifices were deeper than 2 mm so they could not be revealed via troughing [15]. Separation, curvature and fusion are more likely to occur to this location, so as a clinician, we should not only memorize the common anatomical configurations, but also identify the unusual ones. For the mesial root system of mandibular molars, besides mesiolingual (ML) canal,

mesiabuccal (MB) canal, sometimes its own an accessory mesial canal. The distribution pattern of the third canals was similar in mandibular molars. 45% located closer to ML canals, 30% located in the middle between the ML and MB canals (mesial middle canals) and 25% located closer to the MB canals [12,16]. Recent research has shown that the prevalence of MM canals was 8% in second molars. The detection and biomechanical cleaning of this kind of area during root canal treatment are critical [11].

Every attempt should be made to find all canals to ensure successful endodontic treatment. Hence, some auxiliary tools in procedures may be necessary. It was demonstrated that the root canal orifices was more accurately detected under a dental operating microscope (DOM) than that with naked eye and the surgical loupes [17,18] increased the detection rate to 93%, even if canal anatomy was complicate [19]. The two-dimensional radiography is the most conventional technique in endodontics therapy, however, it's difficult to achieve angled radiography, the overlapping and distortion of roots and canals may influence the judgment of clinicians [19]. The distinct advantages of cone beam computed tomography (CBCT) is that provides reliable information about the accessory roots and canals in three dimensions clearly without destructiveness [7,8,19,20] and allow clinicians manipulate the images at different sections. The CBCT could detect the periodontal hard tissue damage which is inapparent in conventional radiography [21,22]. Compared with traditional CT, CBCT appeared a lower cost and radiation dose, was helpful and suitable in the field of endodontics [23].

Some diverged canal at a deep level and tiny ones only could be identified after removing precisely the dentin coverage with ultrasonic instrument and shaping [19,24]. Trying to detect and identify the aberrant canals that possibly exist should be persisted throughout the root canal treatment.

4. CONCLUSION

Although it's a extremely rare case, a five-canaled configuration may be exist in the mandibular second molar. The clinicians should aware of these extra canals in root canal treatment and use suitable diagnostic methods to identify and detect to ensure the success at utmost.

CONSENT DISCLAIMER

As per international standard or university standard, patient's consent has been collected and preserved by the authors.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:

The peer review history for this paper can be accessed here:
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