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Root Canal Treatment of Three - Rooted Maxillary Second Premolar Done by Undergraduate Dental Student - A Case Report

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Authors' contributions

This work was carried out in collaboration between all authors. Authors EMA and NMS designed the study, wrote the protocol, wrote the first and final draft of the manuscript. Authors AKEF and NMH performed the treatment of the case and managed the literature searches. All authors read and approved the final manuscript.

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Case Report

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ABSTRACT

The possibility of a three rooted maxillary second premolar is extremely rare; diagnosis and treatment of such cases is challenging especially for undergraduate dental students.
The aim of this report is to present a root canal treatment of a very rare case of a three rooted upper maxillary second premolar tooth done by an undergraduate dental student. The tooth was diagnosed as acute irreversible pulpitis. Visually the tooth morphologically looked as a normal premolar but radiographically revealed anatomical variations of three roots. Access cavity was opened carefully; three canals were detected, negotiated, biomechanically prepared and obturated by cold gutta percha lateral condensation technique. The tooth is now completely asymptomatic for almost five months and will be both clinically and radiographicaly monitored bimonthly.
A correct radiographic and clinical examination based on knowledge of anatomical variation of this

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tooth is necessary for successful treatment and better prognosis. Under direct supervision, undergraduate clinical students can perform root canal treatment of difficult cases.

Keywords: Maxillary second premolar; anatomical variations; small molar; RCT, undergraduate dental student.

1. INTRODUCTION

Root canal's configuration has its important significance in Endodontics as inadequate cleaning and shaping will ultimately lead to procedural failure, so knowledge of anatomical variations of teeth is crucial and will directly affect the outcome of the treatment [1]. Many endodontic failures have been attributed to cases where extra canals are expected and clinicians fail to recognize them and so treat them accordingly [2]. Lack of knowledge of the internal anatomy will often lead to errors in all the stages of endodontic therapy including, access, localization, cleaning and shaping as well as obturation of the root canal system [3]. Anatomical variations have been described in the maxillary upper second premolar tooth. Although these variations, especially presence of three roots are rare, the possibility of extra roots or canals should not be overseen to ensure successful endodontic treatment [4].

From the literature, the incidence of three root canals in a maxillary second premolar is very low; Pineda and Kuttler could not find three rooted maxillary second premolar in their study [5]. Kartal et al. [6] and Pecora et al. [7] had reported 0.3%, while Vertucci., 1984 reported 1% [8]. Genetic and racial factors may influence the presence of a third canal in maxillary premolars as it is more frequent in Caucasian populations and virtually non-existent in Asian populations [9,10]. In the Sudan, a study (unpublished) in 2007 found one case of three rooted maxillary second premolar with a percentage of 0.25%. This case is considered the first reported and documented case in Sudan. Our curriculum in Edndodontic follows the recommendation of the European Society of Endodontology as undergraduate student should perform root canal treatment for 20 teeth including extracted teeth [11]. Occurrence of difficult cases during final year (semester 9 & 10); as regulations should be treated by the undergraduate student under close supervision.

The objective of this article is to report a case of a root canal treatment of a rare occurrence of a three rooted maxillary upper premolar done by an undergraduate dental student.

2. PRESENTATION OF CASE

A 35 year old man came to the Endodontic clinic of the fifth year dental students at the Academy Dental Teaching Hospital – Faculty of Dentistry – University of Medical Sciences and Technology complaining of severe pain from a tooth on the upper left back tooth region. The patient was seen and examined by one of the fifth year dental students as one of the endodontic requirements for semester 9 (2014 - 2015). Proximal caries with a class II cavity on the mesial side was detected. The case was diagnosed as acute irreversible pulpitis and root canal treatment was planned for that tooth. The patient's medical history was non-contributory. Preoperative Intraoral Periapical Radiograph (IOPA) revealed two roots as the radiograph was taken at a horizontal angulation. The patient was anesthetized and the access cavity was prepared with an oval shape that was wider buccolingully. The crown morphology and dimensions were within normal limits and provided no indication of the anatomical variations of the radicular portion. The IOPA for working length determination showed a clear third root located distally in a distobuccal position (Fig. 1). The patient was informed about the presence of the third root as a rare case and the student was given a choice to refer the patient to the specialist, but she insisted to proceed with the procedure as if it was a molar tooth. The patient agreed to be treated by the student under direct supervision of the consultant and he signed a written informed consent. The third canal, named as distobuccal, was difficult to detect; EDTA 17% gel was used to soften the area and was first negotiated by ISO size (6) K- file. The canal was consequently prepared to size 15 K- file where the working length was taken again with one file for each canal (Fig. 2). The cleaning and shaping was done by utilizing the step back technique using 17% EDTA as a lubricant and 2.5% sodium Hypochlorite as an irrigant solution. The treatment was completed in four visits and in between visits, the canals were dried by paper points with non setting calcium hydroxide paste used as an inter appointment canal medication. At the final visit, the tooth was completely asymptomatic. The three canals were flushed by 2.5% sodium hypochlorite and dried by paper

points, then master gutta percha cones were checked radiographically (Fig. 3). The canals were obturated by cold lateral condensation technique with confirmation of postoperative radiograph (Fig. 4).

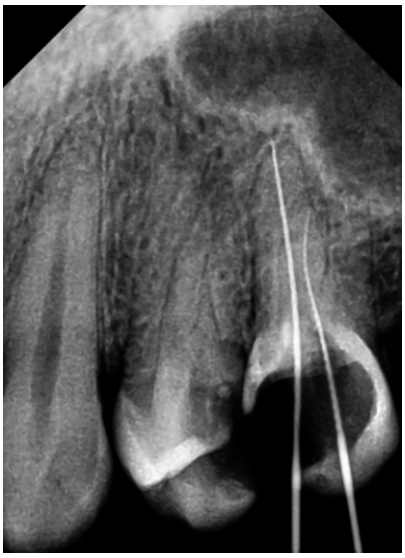

Fig. 1. Working length determination revealed the third root of the second maxillary premolar tooth

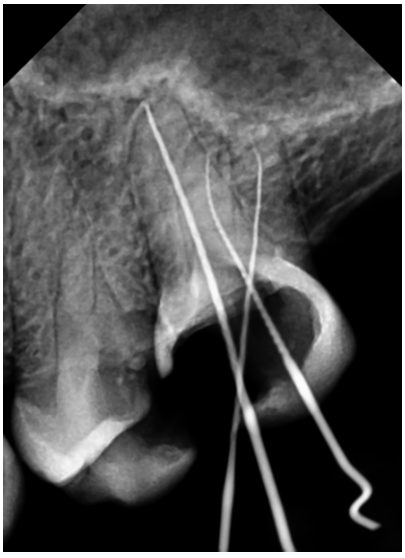

Fig. 2. Working length determination for the three root canals

3. DISCUSSION

Anatomical variations of root canals with ignorance or an undetected extra canal may contribute to the failure of root canal treatment. Morphological variations in pulpal anatomy must be always considered before beginning treatment [3]. Good prognosis and maximization of success rate is achieved when the root canal systems are cleaned, shaped, and obturated in all their dimensions [12]. In our case, the presence of an extra root was discovered radiographicaly during the working length determination. Accurate evaluation of pre-operative radiographs is essential to detect extra roots/canals [13], although Mohan et al. [14] stated that visualization of three-canalled maxillary premolars on preoperative radiographs can often be difficult. As was noticed later during access cavity preparation the mesial location of the buccal canal orifice in relation to the palatal canal should draw the attention to the possibility of the third canal and this should be confirmed by shifting the angle of the x-ray mesially or distally to view overlapped roots or canals [15]. The importance of achieving different angles when taking preoperative radiographs should be recommended as a routine work.

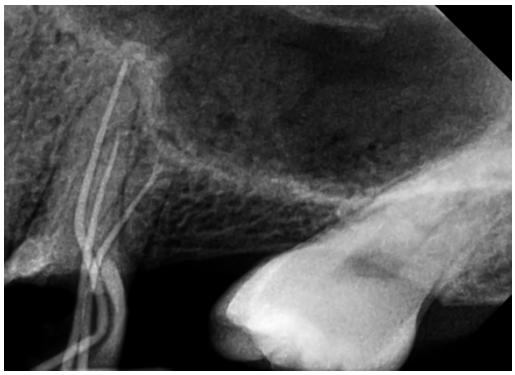

Fig. 3. Master gutta percha cones for the three root canals

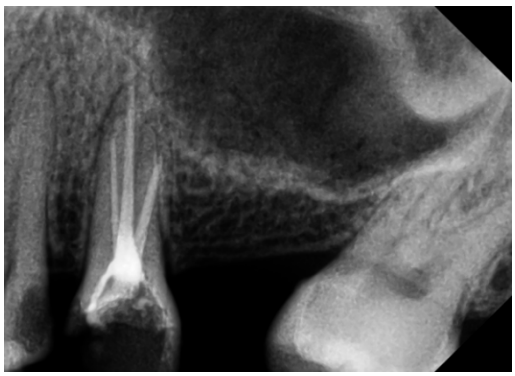

Fig. 4. Obturation of the maxillary second premolar with hermetic gutta percha cones

This type of maxillary premolars with three root canals, palatal, disto-buccal and mesio-buccal, resembling the maxillary molar are often referred to as 'small molars' or 'radiculous' [16]. As stated by Arishu and Alacam, [17] as a general guideline for the identification of a three-rooted maxillary premolar on a straight-on preoperative radiograph is that if the mesio-distal width of the mid-root image appears equal to or greater than the mesio-distal width of the crown image, then the tooth most likely has three canals. Successful endodontic treatment originates from a well-designed and executed access preparation [18], so Chauhan and Singh, 2012 recommended a T-shaped outline to the access cavity to locate the root canal orifices in three-rooted maxillary premolars [4]. The use of EDTA as a lubricant and dentin softener is of great value to canal preparation as in this case the third canal at the start was difficult to explore and negotiate for more than 4 mm apical to the orifice. This necessitated the use of EDTA with 2.5% Sodium Hypochlorite as an irrigant for the full length preparation.

An undergraduate dental student treating difficult cases is an area of a lot of debate. The quality of root canal treatment done by general practitioners in different population had been evaluated [19,20], with result of high percentages of less than ideal. The reason may be related to endodontic teaching undertaken at the dental schools [21]. It would appear that practitioner's continuo to use techniques they were taught during the undergraduate training [22].

It has been shown that most students were not very confident to undertake molar endodontics and many felt that more practical experience is needed as students [23]. Tanalp et al. [24] reported that students felt the lowest confidence in the treatment of maxillary molars followed by mandibular molars; they concluded that the reason may be related to the attitude of dental schools to refer these cases to post graduate students and this will increase students' tendency to refer challenging cases to a specialist in future. In our case the student was so confident and insisted to continue the treatment and she finished it successfully. In contrast to Qualtrough et al. [23]; our student's confidence may be due to the well practicing during the preclinical course by training on at least seven extracted teeth. Practicing on extracted human teeth simulates a real situation and increases student confidence when treating real patients. Shetty et al. [25] proved that a majority of their students prefer preclinical training on extracted teeth and they believed that intense preclinical training will help them to mange patients confidently. Another reason for increasing our students confidence is; no referral policy and closed direct supervision, with a ratio of students: staff of 4:1; which is more than that reported in other studies [21,26]. One study justified poor performance of endodontic treatment among their undergraduate student; because they started endodontic treatment late during fifth year with operative and fixed Prothdontic clinic time, [27] in contrast our students starting clinical endodontic at the begging of the forth year on a separate clinic with direct and abundant supervision, excellent training and enough clinic time.

4. CONCLUSION

Although it is rare to find a three roots maxillary second premolar, it is recommended that an extra canal should be explored clinically and radiographically unless proven otherwise. Under direct supervision; undergraduate dental students can perform some unusual or difficult cases as this will help in their future practice.

ETHICAL APPROVAL

The study was approved by ethical committee in the University Medical Science and Technology, the patient was informed about the presence of extra root and he have had the choice to refuse treatment by undergraduate dental student and he signed informed written consent. The planning for publication of this case was explained to the patient and he accepted with welling.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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