



International Journal of Applied Dental Sciences

ISSN Print: 2394-7489
ISSN Online: 2394-7497
IJADS 2019; 5(1): 17-19
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www.oraljournal.com
Received: 08-11-2018
Accepted: 11-12-2018

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A case report on aberrant root canal morphology of mandibular first premolar

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Abstract

The likelihood of additional canals in mandibular premolars is quite rare; hence critical evaluation of the root canal morphology must be taken into account in clinical and radiographic evaluations during root canal treatment. This case report describes the presence of one root and three canals in mandibular premolar. The case report emphasizes the significance of thorough knowledge regarding root canal morphology and probable variations to upsurge the clinician's ability to treat challenging cases.

Keywords: Mandibular premolar, anatomical variation, additional canals, endodontic treatment

Introduction

Root canal morphology varies from tooth to tooth, the knowledge of biology, physiology, morphology and anatomy of root canal system is required for consistent and successful endodontic treatments. It also requires appropriate instruments and the knowledge of how to use these instruments effectively^[1]. Teeth with additional roots and/or canals pose a particular challenge for the success of treatment. The presence of an untreated or missed canal may be a reason to failure of endodontic treatment. Inability to find or locate and treat these additional root canals may cause treatment failures particularly in teeth that have anatomical variations. Mandibular premolars are most difficult teeth to treat in the oral cavity, because of the aberrations in their root canal morphology^[2-4]. Due to this complexity in morphology and anatomy of root and root canals, mandibular first premolar is acknowledged as "Endodontist's Enigma". This is because they are anatomically unpredictable, and often present with a wide variety of morphological rarities^[5]. Thorough inspection of preoperative radiographs can be assisted in tracing additional root canals or roots. Thus, root canal therapy of these teeth should be carried out by using x-rays from different angulations, efficient explorers, wider access openings, adequate illumination and, whenever possible, image magnification has to be done^[1]. In study done by Jojo Kottoor, it was reported that 23-30% anatomical and morphological configurations of mandibular first premolars are more prone to bifurcation of canals and 15-20% terminating in multiple apical foramina.⁶ This case report represents type II classification of root canal morphology and anatomy as described by Gulabivalas^[7] in 2001 which specifies three separate canals from orifice and two canals at the apex.

Case report

A 56 years old male patient reported to the department of Conservative Dentistry and Endodontics at Vyas Dental College and Hospital with the chief complaint of pain in the posterior right lower back tooth region since 3-4 days. Patient mentioned past dental history with respect to the same tooth, it was noted that patient had initiated his root canal treatment outside in private clinic, as the pain was not subsiding, patient reported to our department for the same. On clinical evaluation, tenderness on vertical percussion was present with 44. On radiographic assessment, radiolucency involving enamel, dentin and pulp was seen and periapical radiolucency was seen in IOPA. The radiographic interpretation revealed two root canals initiating from the pulp chamber to the apical third (Figure1). After proper access opening and radiographic working length determination presence of 3-2 configuration of root canals had been noted (Figure 2).

The treatment procedure was planned and explained to the patient. After obtaining patient's consent, pre-endodontic build-up was done using composite (Filtek Z350 XT, 3M). Rubber dam isolation was done and the pulp chamber was examined with the help of magnifying loupes (Seiler), two different orifices were located using DG 16 endodontic explorer. Access opening was refined using Endo-Z access bur in a high speed airtor handpiece. Stainless steel #10 K file was used to check the patency of all the canals. #15 K file was used to determine working length radiographically, which was confirmed by using apex locator (Propex II, Dentsply, Maillefer, USA).

Chemo-mechanical preparation was accomplished in relation to 44, apical preparation was done till #25 K file (Dentsply-Maillefer) with all three canals under copious irrigation. Recapitulation was performed using smaller K file, irrigation was done with 5% sodium hypochlorite solution and 17% EDTA and final rinse was done using saline.

After chemo-mechanical preparation was finalised, calcium hydroxide was given as intracanal medicament followed by temporary closed dressing and patient was recalled after 5 days for further procedures. On follow up, after clinical evaluation the tooth was asymptomatic, temporary closed dressing and intracanal calcium hydroxide was removed. Irrigation was done followed by mastercone radiograph (Figure 3) and obturation was completed with lateral condensation using sealapex as a sealer. Post obturation restoration was done with composite (Filtek Z350 XT, 3M) (Figure 4).

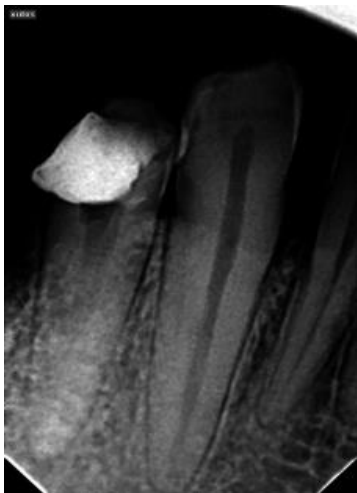


Fig 1: Pre-operative radiograph



Fig 2: Working length determination radiograph



Fig 3: Master cone radiograph showing 3 canals



Fig 4: Post obturation radiograph

Discussion

Variations in morphology of mandibular premolars root and root canals are well documented in literature both in terms of anatomic studies and clinically reported cases [8].

Root canal system of mandibular premolar shows high levels of diversities and complexities [9, 10], hence an immense knowledge of root canal morphology and anatomy is required [11].

Mandibular first premolar is reported to be one of the most challenging teeth for the endodontic treatment because of its aberrant internal morphology, apical deltas, additional root canals and lateral canals which causes difficulty in cleaning and shaping of missed canals that leads to failure of root canal treatment as there is difficulty in locating extra canals [11]. Hence, various methods can be used for the assessment of root canal morphology.

To examine the proper morphology and anatomy of tooth preoperative radiographs from multiple angulations should be taken i.e. straight, mesial and distal angulations using parallel technique should be taken to provide insight into the number of existing root canals. Martinez-lozano *et al.* stated that for detecting the extra canals recommend upto 40° mesial angulation from horizontal plane. In mandibular premolars, x-ray angulation from 15°-30° in vertical axis was more efficient in analysing root canal anatomy [12]. Yoshioka *et al.* reported that sudden change in radiographic density and sudden narrowing of the chief canal on the radiograph which designates multiple roots and root canals [13]. According to

several studies performed on mandibular premolars, 47% incidence of accessory foramina, 38.7% lateral canals and 4.38% apical delta was reported [14, 15]

Vertucci *et al.* reported that in 97.5% the mandibular first premolar had one root canal at the apex and only 2.5% had two root canals at the apex of the teeth; however, three root canals were most infrequent [3] Zillich and Dowson found only 0.4% incidence of three canals in mandibular premolars. Four roots were rare and were found in less than 0.1% [16]

As advancement in better magnification and accessibility dental loupes, operating microscope and CBCT can also be used as adjunct for identification of pulp chamber, location of canal orifices, additional roots and root canals.

Conclusion

Extensive knowledge is needed for critical evaluation of multiple roots and root canals and various diagnostic modalities are also of foremost importance for clinicians in diagnosing and treating teeth with aberrant morphology and anatomy for successful root canal treatment.

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