Permanent maxillary first molar morphology has been studied widely. Usually, it has three roots with three canals and the frequent deviation being incidence of a second mesiobuccal canal, thus showing a multifaceted root canal anatomy. Other variations comprise four and five roots and abnormal root canal morphology within individual roots. Many case reports with five and six root canals or a C-shaped canal configuration have been reported in the past. This varying number of root canals poses a challenge for endodontist in detecting and treating by root canal treatment. This problem can be avoided using techniques such as using the dental operating microscope and cone-beam computed tomography (CBCT). We report a change in canal morphology case of maxillary first molar having seven root canals, its evaluation, and management using latest equipment such as CBCT.

**Keywords:** Cone-beam computed tomography, molar, root canal therapy

**INTRODUCTION**

Several authors have comprehensively reported about the morphology of the permanent maxillary first molar. Generally, maxillary first molars have three roots with three canals. Sometimes, the number of canals vary, second mesiobuccal canal being the most common variation, between 18% and 96.1%. Studies have shown the occurrence of third mesiobuccal canal to be in between 1.3% and 0.1%. However, Lee et al. and Kim et al. described the occurrence of two root canals in distobuccal root to be 1.9% and 4.3% of their sample, respectively. Few other reports showed maxillary molars with palatal roots having two canals in about 2%–5.1% of cases. Few cases reports presented maxillary molars with three canals in mesiobuccal, distobuccal, or palatal root. Martins reported mesiobuccal root of maxillary first molar having four canals.

We report the evaluation and management of a maxillary first molar, presenting with three roots and seven root canals, with three mesiobuccal, three distobuccal, and one palatal canal. Our findings were confirmed with the help of cone-beam computerized tomography (CBCT).
A 45-year-old male patient reported to the Department of Conservative Dentistry and Endodontics, with a chief complaint of pain in upper right posterior tooth region, for the past 1 week. After obtaining informed consent from the patient, complete history was taken and it revealed he had mild intermittent pain, mainly during nights, which increased since 1 week. He also complained of sensitivity after cold and hot drinks. On examination, a deep carious lesion on mesio-occlusal and disto-occlusal surface of maxillary right first molar and endodontically treated second molar. 16 was tender on vertical percussion. With acute apical periodontitis in 16 as diagnosis, endodontic treatment was planned and intraoral periapical (IOPA) was taken.

After local anaesthesia and application of rubber dam, access opening of 16 was carried out [Figure 1]. We suspected multiple root canals during biomechanical preparation and used DG-16 endodontic explorer (Hu-Friedy, Chicago, IL, USA) under surgical operating microscope (Seiler Revelation, St Louis, MO, USA). In mesiobuccal root, we could locate two canal openings (MB1 and MB2), along with one each in palatal and distobuccal roots. On further careful preparation with 6, 8, and 10 files, we could locate additional canal openings, three in mesiobuccal root (MB1, MB2, and MB3), three in distobuccal root (DB1, DB2, and DB3), and one in palatal root [Figure 2].

IOPA at different angles was taken to determine the working length using an apex locator (Root ZX; Morita, Tokyo, Japan) [Figure 3]. To confirm the abnormal root anatomy with multiple canals, a CBCT of maxilla was taken after explaining the procedure to the patient and taking his consent. The obtained cross-sectional images in axial, transverse, and sagittal planes [Figures 4 and 5] were analyzed by CS 3D imaging software (Carestream Dental LLC) to find out the canal morphology. CBCT images showed the tooth to have three roots and seven root canals (three each in mesiobuccal and distobuccal roots, and one in palatal root). The images also showed endodontically managed second molar with abnormal root canal morphology.

Later, in the next appointment, using Hyflex CM rotary instruments along with lubricant, cleaning and shaping of root canals was carried out. After drying the canals with absorbent points, the canals were obturated with gutta-percha and AH Plus resin sealer (Dentsply Maillefer) [Figure 6]. Finally, composite resin filling was carried out and advised the patient for porcelain crown. Follow-up of patient after 3 months did not reveal any symptoms from the restored tooth.

**DISCUSSION**

Endodontists must possess thorough knowledge about internal anatomy of teeth to successfully manage cases of pulpal decay. The advent of newer technologies such as CBCT has helped this purpose. Weine et al.[10] based on root canals position within a root, divided root canals into four types. Whereas Vertucci[11] identified eight pulp space configurations. Recently, Sert and Bayirli[12] studied in detail of complexity of root canals systems and suggested 14 canal types. Later Al-Qudah and Awawdeh[13] proposed eight new types of supplemental canal configurations.

Baratto Filho et al.[14] carried out an in vitro study on 140 extracted maxillary first molars and found a maxillary molar with three mesiobuccal, three distobuccal, and one palatal root canal, making seven root canals. Nayak et al.[15] also reported similar finding of seven canals in a left maxillary first molar. Al-Qudah and Awawdeh type (3-2) and type (3-2-1) supplemental canal
configurations were seen in mesiobuccal and distobuccal roots and Vertucci Type I (1-1) canal configuration (xx) in palatal root. Whereas Kottoor et al.\[16\] reported eight canals in a left maxillary molar, similar to Baratto Filho et al. and Nayak et al. and our case, but with an extra canal in palatal root. A Sert and Bayirli type XV (3-2) canal was seen in the mesiobuccal and distobuccal roots, whereas a Vertucci type II (2-1) canal was seen in the palatal root.

Literature search revealed that many cases reporting three canals in MB root were having Sert and Bayirli type XV (3-2) canal configuration.\[17,18\] Whereas Du et al. and Ayranci et al. observed Sert and Bayirli type XVI (2-3) and type XVIII (3-1) canal configuration, respectively.\[19,20\] A Vertucci type VIII (3-3) canal configuration was seen in the MB root having three canals by Badole et al. and Munavalli et al.\[21,22\] However, Gulabivala’s supplemental type III (3-2) canal pattern in DB root with three canals was reported by Karthikeyan and Mahalaxmi.\[23\]

The present case showed Al-Qudah and Awawdeh type (3-2-1) and type (3-1) in the mesiobuccal and distobuccal roots, respectively, and Vertucci Type I (1-1) in the palatal root. Our findings are similar to that of Baratto Filho et al.\[14\] Several authors believe that since mesiobuccal and distobuccal roots are broader, there are more chances of occurrence of additional canals. In some cases, these broad mesiobuccal and distobuccal roots fuse with palatal root, thereby resulting in extra canals. CBCT scanned images in the present case showed broader mesiobuccal and distobuccal roots but did not fuse with the palatal root. The broader roots might be the reason for the occurrence of multiple canals in our case.

Conventionally, to assess root canal configuration before, during, and after endodontic treatment, IOPA radiographs play a vital role. However, these radiographs have certain limitations, thus newer diagnostic tools such as CBCT scanning are being used recently, mainly in cases with suspected unusual root canal morphology.\[24\] CBCT data were of great utility in our case to assess root canal configurations.
morphology in our case with seven root canals, namely, MB1, MB2, MB3, DB1, DB2, DB3, and P.

We observed that the primary reason for successful management of tooth with complex internal anatomy with seven root canals was dependent on the dental microscopy and CBCT imaging. Hence, we suggest that endodontists should get familiarized with the use of dental microscopy and new imaging techniques such as CBCT scanning, to increase the success rates, especially in teeth with complex anatomy.

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**CONFLICTS OF INTEREST**

There are no conflicts of interest.

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