Spiral CT aided endodontic management of maxillary molar with four roots and four canal: a case report

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Introduction:

Successful endodontic treatment is mainly dependent on cleaning, disinfection and 3D obturation of the root canal system. To achieve this, proper access opening and locating the canals, adequate biomechanical preparation, disinfection of the canals and sealing all the canals apically and laterally are important steps to be followed to prevent recontamination of the root canal system[1, 2]. Aberrations in root canal configuration mainly in multirooted teeth can pose a challenge to the endodontist during root canal treatment. Failure to locate extra canal or root will lead to insufficient cleaning of the root canal system ultimately leading to failure of endodontic therapy[3]. Number of studies is present reporting the canal configuration and variation in root canal anatomy of maxillary molar[4, 5, 6]. Considering the second molar, apart from the usual three canal anatomy many studies have reported occurrence of extra root making it an unusual four root scenario[7, 8, 9].

This paper describes a case of maxillary second molar with unusual root canal anatomy having two buccal and two independent palatal roots.

Case report:

A 32 year male with non-contributory medical history reported to the department of conservative dentistry and endodontics with chief complain of pain and sensitivity in the maxillary left back tooth since 3-4 months. On examination maxillary left second molar (27) had deep carious lesion on the mesial surface of the tooth. IOPA examination revealed carious exposure of the tooth 27 [figure 1 a]. Root canal treatment of tooth 27 was planned.

After administration of local anaesthesia the tooth was isolated with the rubber dam. Access cavity preparation was done [figure 1 c]. The floor of the pulp chamber revealed peculiar X type of dentinal map leading to the location of extra palatal root below the mesio palatal cusp. IOPA examination with k files confirmed presence of extra palatal root.

Further dentascan of tooth was done to confirm the root canal anatomy and presence of extra root [figure 1 b].

Working length after negotiating the canal was determined with canalpro apex locator (coltene) and confirmed IOPA with k files [figure 1 d]. The tooth was prepared with hyflex cm files. 2.5% sodium hypochlorite and 17% EDTA was used as irrigating solution for disinfection of the canals. Following proper cleaning and shaping of the root canal calcium hydroxide was placed as an intra canal medicament and the cavity was sealed with temporary cement (cavit 3M ESPE).

After one week follow up visit patient was asymptomatic. Temporary cement was removed. Calcium hydroxide was irrigated out of the canal and final irrigation was done with 2% chlorhexidine. Appropriate gutta percha master cones were selected and master cone IOPA was done [figure 1 e]. Obturation of the root canal was done with cold lateral compaction

technique with GP cones and resin sealer (technodent) [figure 1 f]. Final Restoration of the tooth was done with composite resin.

Discussion:

Common presentation of root canal system in maxillary second molar is 3 roots with 3 canals[10]. Presence of one root and one canal and two roots and two canal in maxillary second molar has been reported from 3.1% to 0-12% respectively[11,12]. The prevalence of four rooted maxillary second molar is rare and reported to be 0.4%[13]. Al Shalabi et al. and Caliskan et al. in their *ex vivo* study reported 1.2% and 3.23% two palatal roots in maxillary second molar, respectively[14,15].

Christie and others had classified 4-rooted maxillary molar in 3 types on root separation level and divergence[16]. Type I maxillary molars have two widely divergent, long, and tortuous palatal roots. The buccal roots are often “cowhorn-” shaped and less divergent. Type II maxillary molar has four separate roots, but the roots are often shorter, run parallel, and have buccal and palatal root morphology with blunt root apices. Type III maxillary molar is also constricted in root morphology with the mesiobuccal, mesiopalatal, and distopalatal canal encaged in the web of root dentin. The distobuccal root in these cases appears to stand alone and may even diverge to the distobuccal. Based on this classification, the maxillary right second molar presented here could be considered a type I molar (well separated roots).

Most of the cases of extra root canals are left untreated leading to failure of endodontic treatment. Careful examination of Intro-oral radiograph with different angulations could

help diagnose extra root. Knowledge of morphologic aberration of the root canal, and root outline could reduce the failure rate of root canal therapy due to missed canals.

Properly designed and prepared access cavities is the initial step in locating canal orifices which will eliminate many potential problems during canal preparation and obturation. In case of the present paper, a large access was required on palatal side to locate the 2 palatal roots. Teeth with 2 palatal roots often have a wider mesiodistal dimension of the palatal cusps[17]. The observation of a palatogingival groove on palatal surface of crown and root indicates the chances of two palatal canals[16]. The access outline will be square rather than triangular in such cases. Clinical photograph of floor shows two well-separated palatal orifices. Vertucci studied the proximity of canal orifices and their separation at apical area. If the separation of orifices is greater than 3 mm, canals remain separated through the entire length and usually joined when distance is less than 3 mm[18].

Contemporary CBCT scans, Spiral CT as a diagnostic and treatment planning tool has extensive applications in endodontic. They have the provision of three dimensional image reconstructions, image alteration and analysis of the altered image. Use of CBCT scans is more inclined in situations of diagnostic dilemmas like developmental anomalies and root canal aberrations[19]. In the presented case reports Spiral CT was done to detect and confirm presence of extra palatal root.

Conclusion:

Reading of the dentinal map in the presented case was important in guiding and locating the extra mesio-palatal root. Although Encounter of such cases is infrequent, dentists should be aware of such anatomic variation for successful endodontic treatment. Use of microscope,

loupes and proper reading of IOPA plays keys role in determining such aberration and minimizing operator error. Failure to locate such canals or roots can lead to failure of endodontic treatment.

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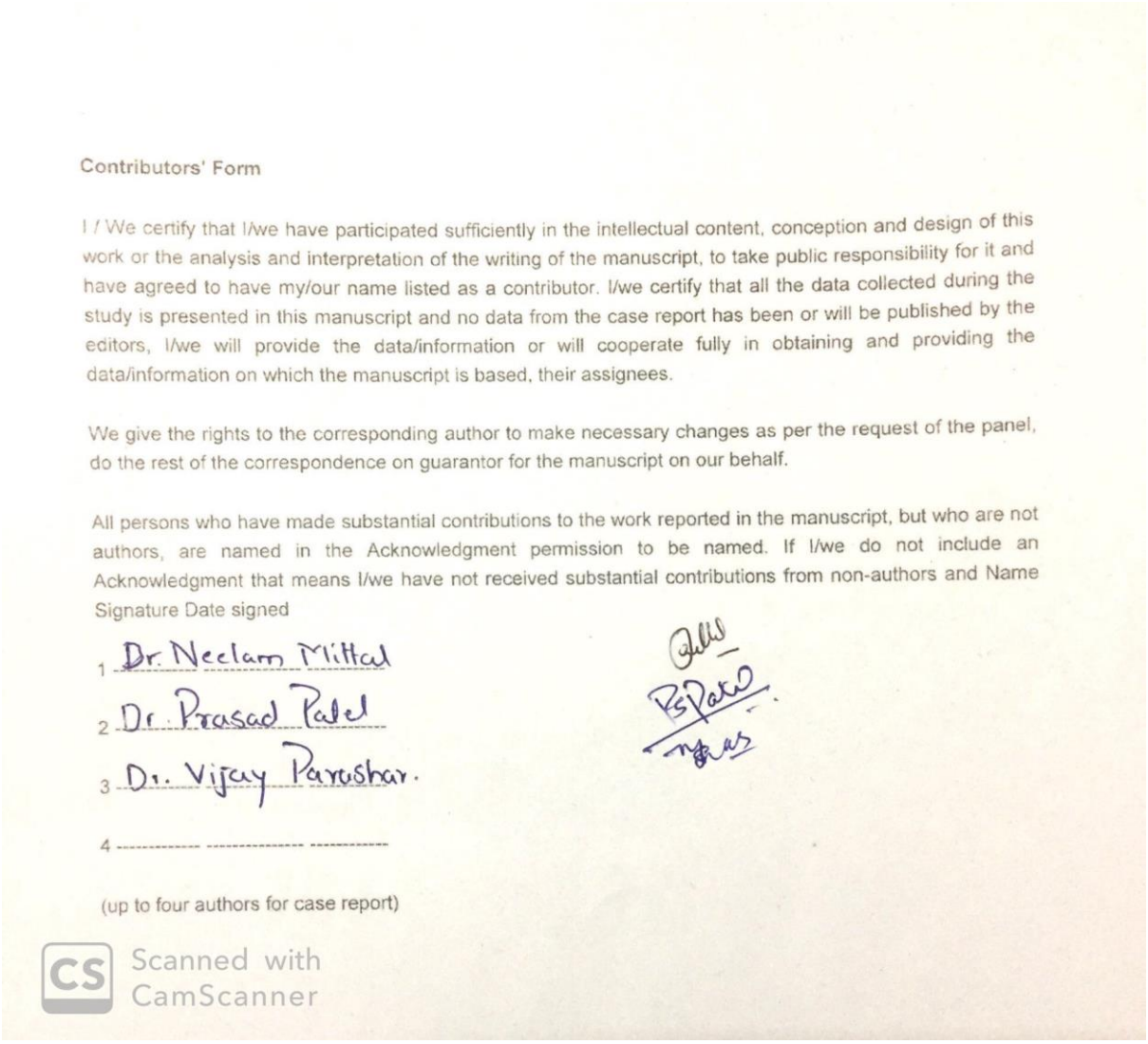

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