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MANAGEMENT OF C-SHAPED CANAL IN MANDIBULAR SECOND MOLAR: A CASE REPORT

Dental Science

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ABSTRACT

Variations of root canal systems need not always be in the form of extra canals. Clinicians should be aware that there is a possibility of existence of fewer numbers of roots and root canals than normal, which presents varied canal anatomy and poses a challenge to the clinician's expertise. This case report deals with the management of an unusual case of C-shaped canal in mandibular second molar. Cone-beam computed tomography (CBCT) was employed to confirm the extension of the unusual anatomy. 3-D Obturation done with the help of thermoplastic obturation unit.

KEYWORDS

C-shaped canal, CBCT, 3D obturation

INTRODUCTION:

A thorough knowledge of root canal anatomy is necessary to achieve appropriate cleaning and shaping of the root canal system and ensure success of endodontic treatment. [1] C-shaped canal anatomy was first documented by Cooke and Cox in mandibular second molar[2]. Canal configuration has a high prevalence in mandibular second molars (2.7% - 45.5%)[3].

C-shaped canal configuration results from the failure of the Hertwig's epithelial sheath to fuse or its inadequate development during the root embryologic stage. Failure of the Hertwig's epithelial sheath to fuse on the buccal side will result in the formation of a lingual groove, and failure to fuse on the lingual would result in a buccal groove. Failure of the sheath to fuse on both the buccal and lingual sides will result in the formation of a conical root[4].

The C-shaped canal configuration has racial predilection. Higher incidence reported in countries belonging to the Asian continent like Chinese (31.5%) and Koreans (44.5%)[5,6].

C-shaped canals are rarely found in other teeth. Some case reports and studies reported variation-shaped canals in maxillary first molars, mandibular first molars, mandibular premolars and third molar teeth[7-12].

Melton's Classification:

Category I: continuous C-shaped canal running from the pulp chamber to the apex defines a C-shaped outline without any separation (C1).
Category II: the semicolon-shaped (;) orifice in which dentine separates a main C-shaped canal from one mesial distinct canal (C2).
Category III: refers to those with two or more discrete and separate canals:

- Subdivision I: C-shaped orifice in the coronal third that divides into two or more discrete and separate canals that join apically.
- Subdivision II: C-shaped orifice in the coronal third that divides into two or more discrete and separate canals in the mid root to the apex.
- Subdivision III: C-shaped orifice that divides into two or more discrete and separate canals in the coronal third to the apex (C3)

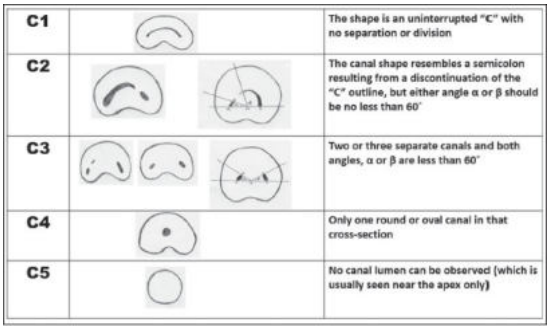

Fig – 1 Classification of C-shaped canal by Melton

Fan's Classification:

Fan et al., classified C-shaped roots according to their radiographic appearance into three types.

Type I: conical or square root with a vague, radiolucent longitudinal line separating the root into distal and mesial parts. Mesial and distal canals merged into one before exiting at the apical foramen .

Type II: conical or square root with a vague, radiolucent longitudinal line separating the root into distal and mesial parts. Mesial and distal canals continue on their own pathway to the apex .

Type III: conical or square root with a vague,radiolucent longitudinal line separating the root into distal and mesial parts. Of the mesial and distal canals, one canal curved to and superimposed on this radiolucent line when running toward the apex, and the other canal continued on its own pathway to the apex.

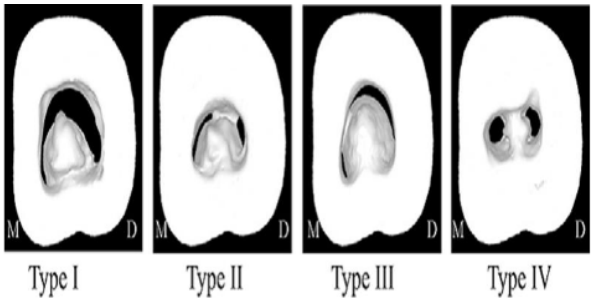

Fig-2 Fan's Classification

Case report:

A 19 year old female patient reported to us with a chief complaint of pain in lower right back tooth. Intraoral examination revealed dental caries on tooth 47. History revealed intermittent pain with the right mandibular second molar for the past 25days, which had increased in intensity for the past 3 days. Subjective symptoms included sensitivity to thermal stimuli and an increase in intensity of pain. The patient's medical history was non-contributory.

Clinical examination of the right mandibular second molar revealed the presence of a large carious lesion . Periodontal probing around the tooth showed normal alveolar bone morphology, normal sulcular depth, absence of pockets, and mobility within physiological limits.

Electric pulp testing (Parkell Electronics Division, Farmingdale, NY) showed exaggerated response. Preoperative radiographs revealed radiolucency approaching the pulp space(Fig – 3). A CBCT of the tooth was also done for preoperatice assessment, in which the axial sections indicated the cross sectional shape to be C-Shaped (Category 2) & severe buccolingual curvature was also detected. (Fig- 4). This was diagnosed as Chronic irreversible pulpitis and routine nonsurgical endodontic treatment was planned.

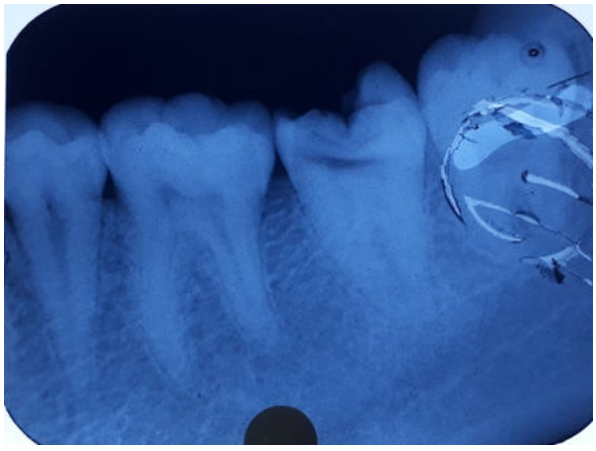

Fig – 3(Pre operative iopa radiograph showing carious tooth)

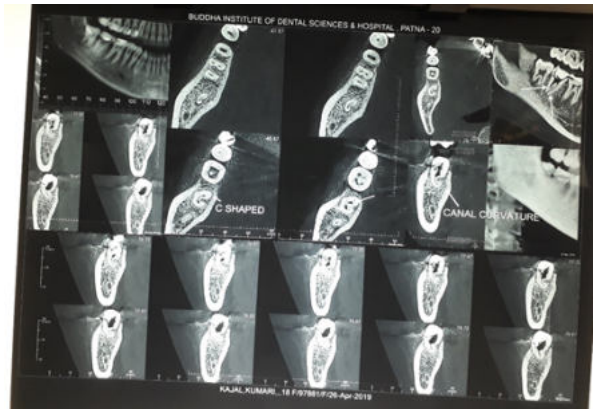

Fig -4(CBCT)

Local anesthesia was induced using 1.8 ml 2% lidocaine with 1: 200,000 epinephrine (Xylocaine, AstraZeneca Pharma India Ltd, Bangalore, India). Following caries excavation, Rubber dam was placed and a conventional endodontic access opening was established with an Endo Access Bur (Dentsply Tulsa, Tulsa, OK). On access opening, a single large C-shaped canal was located in the center of the pulp chamber.(Fig-5)

Working length was determined using an apex locator (Root ZX II, Morita, Tokyo, Japan) and confirmed with radiographs.(Fig -6) Cleaning and shaping was done with ISO 2% taper files up to size 25 (Mani Inc, Tochigi-Ken, Japan) and protaper(Dentsply Maillefer). All canals were irrigated after each file using 2 ml of 3% NaOCl &, 17% ethylene diamine tetra acetic acid (EDTA; Prime Dental Products Pvt Ltd, Mumbai, the final irriagation being chlorhexidine2%. The canal was dried with absorbent points (Dentsply Maillefer, Ballaigues, Switzerland) and obturation was performed by downpack and backfill thermoplastic obturation unit.(Fig -7).Confirmed by a radiograph.(Fig-8). After completion of root canal treatment, the access cavity was restored using resin composite. Follow up after 3 months was done.

Fig – 5 (Access cavity)

Fig-6 (Working length determination)

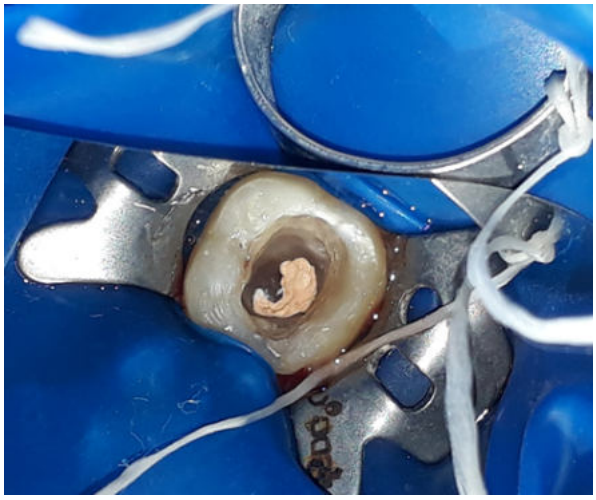

Fig – 7(Post Obturation photograph)

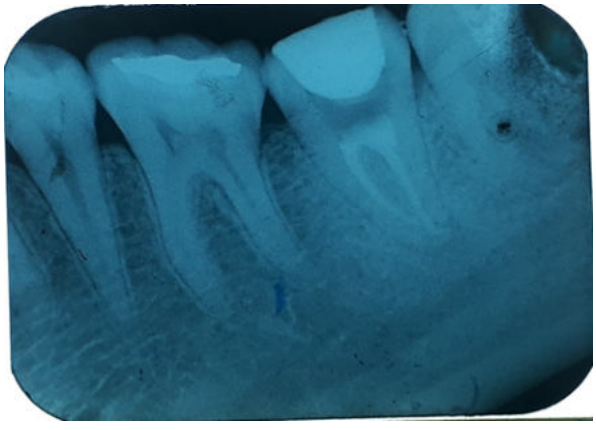

Fig – 8 (Post operative iopa radiograph)

DISCUSSION:

The mandibular molars erupt at an age of 6-7 years and apical closure is usually completed by 8-9 years. The completion of canal differentiation commences about 3-6 years after root completion[13]. Any disturbances in this differentiation can result in variations in canal anatomy. Sabala *et al*., has stated that the rarer the aberration is, the greater the probability of it being bilateral. In this case, the contralateral mandibular posterior was extracted, and hence, the morphology could not be determined[14]. Fava *et al*., had identified the existence of such anatomical variations in second molars in all the maxillary and mandibular second molars[15]. Majority of the permanent mandibular second molars typically present with two well-defined roots, a mesial root with two canals and a distal root with a wide oval canal or two round canals[16]. Apart from these presentations, wide

variations of root and canal configuration of the mandibular first molars have been reported in the literature[17,18].

As a C-shaped canal can have a different configuration along the root, it is not always possible to identify it after pulp chamber opening[19] . Cone beam computed tomography (CBCT) is a three-dimensional imaging technique that allows this problem to be overcome.

Cleaning and shaping in C-shaped canals are difficult due to their altered shape, the instruments do not contact the walls so the cleaning largely depends upon irrigation.So use of proper irrigation protocol is mandatory. 3 D Obturation for these canals is possible only with the use thermoplastic obturation unit.

CONCLUSION:

This case report shows management of C-shaped canal anatomy successfully using thermoplasticised guttapercha technique. It also highlights basic treatment regimen for C-shaped canals and the importance of CBCT as a preoperative radiograph.

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