INTRODUCTION:

A thorough knowledge of the anatomy of teeth involved in root canal treatment is essential for successful debridement and obturation of the root canal system.

Recognition of unusual canal configurations and variations are paramount because it has been established that the root with a single tapering canal and the apical foramen is the exception rather than rule.¹

Of particular interest is the canal configuration of the mandibular second molar as a great deal of variations can occur. C-shaped canals are common with a presence of a thin fin connecting the root canals being the main anatomical feature.²

Once recognised the C-shaped canal presents a challenge with respect to debridement and obturation, especially because it is unclear whether the C-shaped orifice found on the floor of the pulp chamber actually continues to the apical third of the root.²

The present reports describe the root canal treatment in two mandibular second molars with C-shaped canal configurations.

REPORT 1:

A 23 year old female patient came to our Department of Conservative Dentistry and Endodontics, Kamineni Institute of Dental Sciences, Nalgonda, with a chief complaint of pain in the mandibular left second molar. The patient had no significant medical history. Subjective symptoms of prolonged sensitivity to hot and cold were present. The objective symptoms were observed as percussion sensitivity and hyper reactivity to heat and cold, with an absence of periradicular change. 
radiographically (fig 1) and lack of swelling of the surrounding tissue. Therefore, the patient was diagnosed with irreversible pulpitis. The radiograph showed a single conical root which was seen bilaterally (fig 2).

After the administration of local anaesthesia (Lignox 2%, Indico Remidies, Warren, Goa) under rubber dam isolation the access cavity was prepared, the pulp chamber was irrigated with 5% sodium hypochlorite to debride the chamber fully and to identify the nature of the canal system present. The pulpal floor showed a single C-shaped canal extending till the apex (fig 3). Working length was determined using apex locator (Root ZX, J. Morita USA, Irvine, CA) and radiographs (fig 4). Cleaning and shaping was done with rotary ProTaper rotary files (Dentsply Maillefer, Ballaigues, Switzerland) and apical third was shaped to size 40 with K-Flex files (FKG Dentaire, La Chaux-de-Fonds, Switzerland). In between the instrumentation, the canal was irrigated with 5% sodium hypochlorite and passively activated with ultrasonic unit, Piezon EMS (EMS GmbH, Munich, Germany) for 1 minute for maximum debridement of the complex anatomy of the root. Calcium hydroxide intracanal medicament was placed for one week. At the next appointment, the medicament was flushed and smear layer was removed with 17% EDTA and 5% sodium hypochlorite. The canal was obturated with thermoplasticized gutta-percha technique (Obtura II, Obtura Spartan, Fenton, Missouri, USA) and AH-Plus sealer (Dentsply DeTrey GmbH, Konstanz, Germany) (fig 5, 6, 7, 8).

**REPORT 2:**

A 19 year old female patient came to our department with a chief complaint of severe pain in the mandibular right second molar. Clinical and radiographical examination revealed irreversible pulpitis due to dental caries (fig 9).

After rubber dam isolation and access cavity preparation under local anaesthesia, the pulpal floor showed separate mesiobuccal and distal canals (C2 type- Semicolon shape, Melton et al. 1991). The working length radiograph showed as if the file exiting from the furcation of the root (fig 10). Later the cleaning and shaping and obturation of the canal were followed as in case report 1 (fig 11, 12, 13).

**DISCUSSION:**

The variability of the root canal system of multirooted teeth represents a challenge to both endodontic diagnosis and treatment. The preoperative awareness of potential anatomic variations is essential for the success of the endodontic treatment.

The C-shaped canal is not uncommon and this is confirmed by studies in which frequencies ranging from 2.7% to 8% have been reported. The prevalence is higher in the middle Asia upto 10.6% in Saudi Arabians and 19.14% in Lebanese. In northeast Asia, the prevalence is 31.5% in Chinese and 32.7% in Koreans.

This variation may occur in mandibular first molars, maxillary molars, mandibular first premolars and even in maxillary lateral incisors, but it is most commonly found in mandibular second molars. When present on one side, C-shaped canal may be found in contra lateral tooth in over 70% of individuals.

In the view of above incidence and variability in canal configuration, in our present case reports, all the necessary steps to locate, debride and clean and shape the complex anatomy have been followed. The passive ultrasonic activation was done to necessitate the irrigant flow into the complex canal anatomy and thereby maximally debride the root canal system. Thermoplasticized gutta-percha technique was followed for obturation as studies have shown that this technique leads to better flow of the gutta-percha and sealer into the complex anatomy of the canal and gives a three-dimensional obturation of the root canal.

**CONCLUSION:**

Although the prevalence is less, C-shaped canals can vary in number & shape along the length of the root, with the result that debridement, obturation & restoration in this group may be unusually difficult.

Therefore, careful location & negotiation of canals & meticulous mechanical & chemical debridement of the pulp tissue should be carried out in order to successfully treat a C-shaped canal.
REFERENCES:


C-shaped canals in mandibular second molars

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**Fig.4:** Working length radiograph

**Fig.5:** Apical Fill with Obtura II

**Fig.6:** Backfill with Obtura II

**Fig.7:** Post-Obturation view of Access Cavity

**Fig.8:** Radiograph of Post-Obturation Restoration

**Fig.9:** Preoperative diagnostic radiograph

**Fig.10:** Working Length Radiograph

**Fig.11:** Apical Fill with obtura II

**Fig.12:** Backfill with Obtura II

**Fig.13:** Radiograph of Post-Obturation Restoration