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### Abstract

The mandibular canine is known to be a single-rooted tooth with a single root canal. However, two canals with a single root and more rarely two canals with two roots have been reported. This article presents two case reports of mandibular canine. The first case report presents two root with two canals and the second case report presents single root with two canals. Clinicians should always consider the presence of anatomical variations in the tooth morphology during endodontic treatment. Despite the low prevalence, variations may occur in the number of roots and root canals of mandibular canine, as demonstrated in this case reports.

**Key Words** Mandibular canine; two roots; two root canals; endodontic treatment

## INTRODUCTION

Anomalous root and root canal morphology can be found associated with any tooth with varying degrees and incidence<sup>1-4</sup>. Knowledge of the root canal anatomy is the basic pre requisite for successful completion of endodontic treatment<sup>5</sup>. Numerous studies done by various workers reveal a wide variation in the number of roots and root canal pattern in mandibular canines. The occurrence of two roots or even more, two root canals is rare, ranging from 1% to 5%<sup>6,7</sup>. An in Vitro study of permanent human mandibular canines show variation in canal configuration as Type I –70%, Type II 4 to 12%, Type III 4 to 6%, Type IV 4 to 10%, Type V 2% straight canals in 53.84-60.71%, curved canals in 46-39%, apical foramen located centrally in 34.61-57.14%, & apical foramen located laterally in 65.38-42.85% of cases<sup>8</sup>. This paper presents two case reports of mandibular canine with two roots and two root canals and one root with two root canals.

## CASE REPORT-I

A 38 year old female patient was referred to the department of Conservative Dentistry and Endodontics at Haldia Institute of Dental Sciences and Research for endodontic treatment of the mandibular canine and first premolar with chief complaint of severe lancinating, radiating, continuous pain in lower right anterior region since 5 days. Intraoral periapical radiograph (Figure 1) and Intraoral examination revealed dental caries with pulp exposure in relation to 43 and 44. The teeth did not respond to pulp testing procedures.

Endodontic treatment was started, after administering local anaesthesia. Access opening was created using a round diamond bur and an Endo Z tapered safe-end bur. After reaching the pulp chamber, the roof and overhanging dentin from lateral walls were removed to facilitate the location of canal orifices. The orifices of canals were explored and canals were negotiated with #8 and #10 k files. For the straight line access, Gates Glidden drills were

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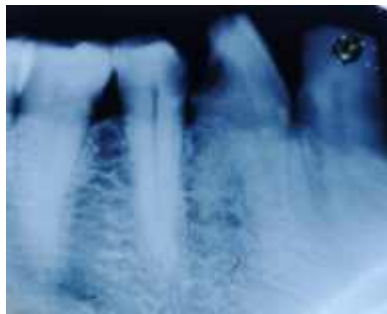
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used to enlarge the coronal third. Examination revealed the presence of two canal orifices: one mesially and one distally and furcation was found to be at middle third. Working length was estimated with Prpex II apex locator (DentsplyMaillefer, Ballaigues, Switzerland) and confirmed by a radiograph with #10 and #15 K-file (figure 2). Step-back preparation was performed with NiTi-flex files (DentsplyMaillefer, Ballaigues, Switzerland) and irrigation with 5.25% sodium hypochlorite and 17% EDTA at each change of file. Calcium hydroxide (Avucal, Dental Avenue PVT LTD) was placed in the canal as intra canal medicament and patient was recalled after 10 days. At the second visit, the teeth were asymptomatic. The canals were flushed out with normal saline and irrigation was done with EDTA solution to remove the "smear layer". Canals were dried using paper point. The apical third was prepared with master apical filling up to No.25 and 30 and confirmed with master cone G.P (figure

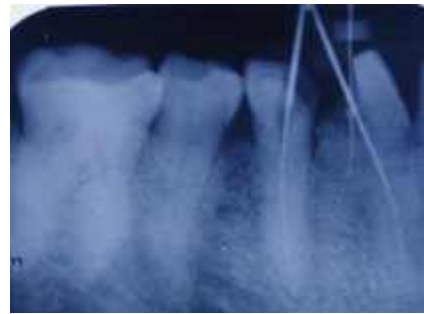
3).The instrumented root canals were obturated by lateral condensation with gutta-percha cones and AHplus sealer. The final radiograph showed two well-obturated canals ending at the electronically located apexes (figure 4). Finally, the access cavity was restored with Type- II glass-ionomer cement. The 6-month post-treatment follow-up showed clinical and radiographic success.

## CASE REPORT-II

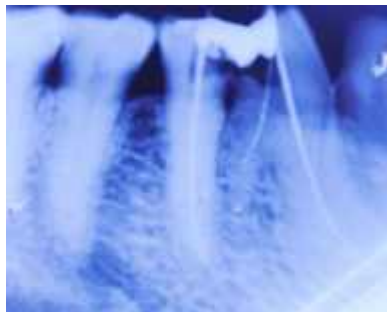
Another 40 yrs old patient was referred to the department of Conservative Dentistry and Endodontics at Haldia Institute of Dental Sciences and Research for immediate pain control. The patient reported a chief complaint of severe continuous throbbing pain with soft tissue swelling in left mandibular premolar region. Pain was increasing



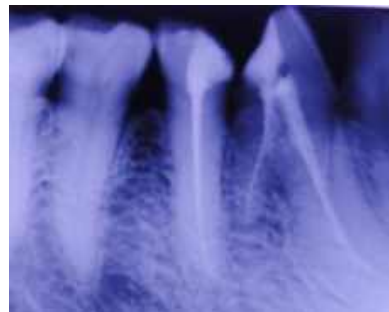
**Fig 1 - Pre-operative IOPA X-ray**



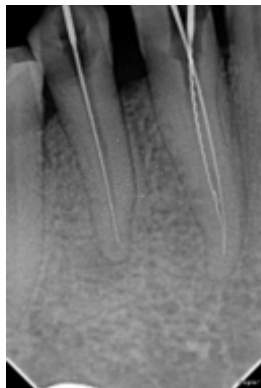
**Fig 2 - Working length X-ray**



**Fig 3 - Master cone X-ray**



**Fig 4 - Post obturation X-ray**



**Fig 5 - Working length X-ray**



**Fig 6 - Master cone X-ray**



**Fig 7 - Post obturation X-ray**

with both hot and cold stimulation. The patient was taking analgesics for relieving pain but pain was not relieved. The teeth 33,34 were carious and pulp exposed. Root canal treatment of involved teeth were advised. Emergency access opening was performed followed by working length determination (figure 5) and after proper biomechanical preparation, master cone was selected (figure 6) and obturation was done (figure 7).

## DISCUSSION

Root canal treatment has achieved success rates of up to 98% in recent years, mainly due to the use of magnification and identification of missed canals, improvement in instrumentation techniques and obturation materials.

However, the root canal treatment may fail due to various causes, such as poor canal preparation, incomplete obturation or irretrievable of separated instruments. Morphological features of the tooth may also adversely affect the success rate<sup>9</sup>. Mandibular canines have one canal and one root in the majority of cases<sup>10</sup>. Laurichesse<sup>11</sup> et al reported that 2% of mandibular canines presented with one root with two canals & 1% had two roots with two canals. Precora<sup>12</sup> et al, in their study of 830 extracted human mandibular canines, found an incidence of 98.3% of teeth having a single root, in which 92.2% had one canal & one foramen, 4.9% had two canals & one foramen and 1.2% had two canals & two foramens.

The use of operating microscopes for magnification has greatly improved the chances of identifying and locating extra canal orifices. The preoperative radiographs in different angulations are useful to find out aberrant root & canal morphology<sup>13</sup>. The access cavity modification & careful examination under microscope plays a very important role to locate any extra canal orifice. It is highly important for the clinician to visualise & understand the topographic location of the furcation area, as well as the precise position of the root canal orifices<sup>14</sup>.

In the first case report two canals were found in two roots (mesially and distally) and in the second case report two canals were found in single root (labially and lingually). Instrumentation of such canals is difficult & efficient debridement may be compromised. The inter-appointment placement of calcium hydroxide was found to be of great help in this regard.

Studies report the incidence of multiple canals from (0-98%). Many clinicians have the perception that a given tooth will contain a specific number of root or canals<sup>15</sup>. Preoperative radiographs in multiple angulations is required. The clinician should have a thorough knowledge of the number, incidence, location & variability of the canal system so as to

justify the selective removal of otherwise unaffected tooth structure in search for hidden orifices.

## CONCLUSIONS

Clinicians should be aware of anatomical variations in the teeth they are managing, and should never assume that canal systems are simple. Even though the most common anatomy of mandibular canines comprises a single root and a single root canal, clinicians should consider the possible variations and always search for the second root canal in teeth with either one or two roots. However multiple angulated radiographs and magnification devices like microscope are important tools in diagnosing and treating such complicated cases.

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