

TECHNIQUES IN DETECTION OF SUPERFLUOUS ROOT MORPHOLOGY: A REVIEW AND CASE REPORT OF A MANDIBULAR CANINE WITH TWO ROOTS.

¹ Sandhya Kapoor Punia

² Meena Kumari.C

³ Jayashree Hegde

⁴ Vikas Punia

⁵ Lakhsman Rao B

¹ Senior lecturer, Department of Conservative Dentistry and Endodontics

² Professor, Department of Conservative Dentistry and Endodontics

⁴ Professor and Head, Department of Conservative Dentistry and Endodontics

³ Senior Lecturer, Department of prosthodontics

⁵ Professor, Department of prosthodontics

^{1,2,4} Darshan Dental College, Loyara, Udaipur, Rajasthan, India.

³ The Oxford Dental College, Bommanhalli, Bangalore, Karnataka, India

⁵ Rama Dental College, Kanpur, Uttar Pradesh, India.

ABSTRACT

The Endodontic paradigm is based on thorough debridement, disinfection followed by three-dimensional obturation of root canal system. A comprehensive knowledge of canal anatomy and its variation is crucial because untreated root canals can lead to endodontic failure. The prognosis of endodontic treatment in teeth exhibiting a complex anatomy is unfavourable if clinicians fail to recognize extra canals. Many investigators have reported anatomical variations associated with mandibular canine. Mandibular canines are recognized as usually having one root and one root canal in most cases, although approximately 6% may have two canals and sometimes two roots (1.2%). This case demonstrates the successful endodontic treatment of a right mandibular canine with an extra root.

KEY WORDS: Root canal Anatomy, Mandibular Canine, Extra roots, Careful Diagnosis.

INTRODUCTION

Successful endodontic therapy of a tooth demands that the dentist should have a thorough knowledge of the root canal morphology as well as detailed radiographic evaluation and diagnosis of the status of the pulp canals and the periapical areas. Improper diagnostic protocol may lead to the failure of endodontic treatment. A wide morphological divergence of the root canal systems is known to exist. Varying numbers of the root canals in different teeth, their anatomy and interconnections have been studied and reported by several authors.^{1,2,3} Generally, mandibular canines have one root canal with one apical foramen. However, the incidence of two root canals in one root with two separate foramina in the mandibular canine is approximately 6% and occurrence of two roots with two canals is rare (1.2%).^{4,5} The aberrations generally occurring in the root canal system create a challenge for the clinician and also influence the outcome of the endodontic procedure. The purpose of this paper is to report a case involving a right mandibular canine with two separate roots requiring intentional endodontic therapy.

Case report

A 53-year-old female patient was referred to Department of Conservative Dentistry and

Endodontics, The Oxford Dental College, Hospital and Research centre, Bangalore, India for intentional root canal therapy of the right mandibular canine as a treatment procedure to receive an overdenture. The medical history of patient was noncontributory and patient had undergone extractions and root canal treatment for the other teeth. The vitality tests showed positive response and single sitting root canal therapy was planned. The diagnostic radiograph revealed the presence of two roots: a buccal and a lingual root (**Fig. 1**). On the contrary, the radiograph of contra-lateral tooth revealed a single root. Local anesthesia was administered and the tooth was isolated using rubber dam. The access to pulp chamber was achieved using round diamond point at high speed. The access cavity was modified to facilitate the location of buccal and lingual canal orifices (**Fig 2**). The patency of each canal was checked using size 15 k flex-o-file. Working length of the canals was determined using apex locator (ROOT ZX, J Morita) and confirmed radiographically (**Fig. 3**). The canals were prepared using crown down technique with protaper rotary files. Copious irrigation was done using 5.25% sodium hypochlorite with every change of instrument. The smear layer was removed using 17% EDTA followed by NaOCl rinse. The canals were dried using paper points. Master cone selection was done (**Fig. 4**) followed by obturation

using gutta-percha and AH plus sealer. The access cavity was restored with coltosol (Coltene Whaledent) (Fig. 5) and the patient was recalled after 1 week. At the following visit, the patient was asymptomatic. The access cavity was etched, primed and restored with light cure composite resin.



Fig.1.Preoperative radiograph of mandibular canine showing two roots

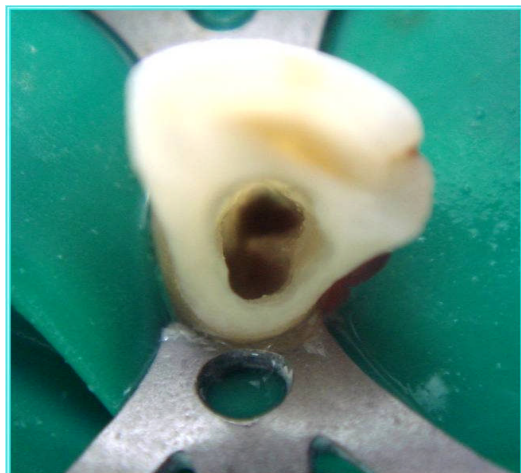


Fig. 2 Access opening showing two distinct canal orifices connected by an isthmus

Discussion

The hard tissue repository of the human dental pulp takes on numerous configurations and shapes. A thorough knowledge of tooth morphology, careful interpretation of angled radiographs, proper access preparation and a detailed exploration of the interior of the tooth are essential prerequisites for a successful treatment outcome.

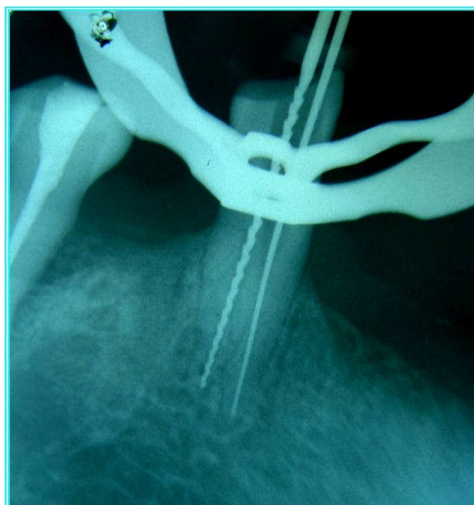


Fig. 3. Diagnostic length files placed in two canals

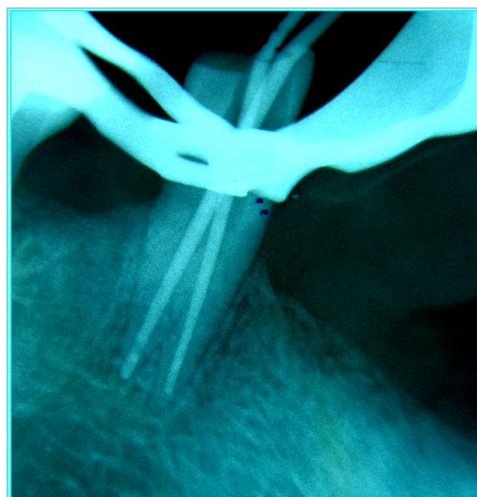


Fig. 4. Master cone Radiograph.



Fig. 5 Obturation.

The anatomy of root canal system dictates the condition under which root canal therapy is carried out and can directly affect its prognosis. Extra root or root canals if not detected are a major reason for failure of this treatment.⁵

In the case presented, two root canals with separate foramina were distinctly observed in the mandibular right canine (Vertucci type IV) which is very similar to a case presented by Arcangelo et al, who reported a mandibular canine with two root canals and separate apical foramina.⁶ Holtzman reported a mandibular canine with three root canals⁷ and Heling reported a mandibular canine with two roots and three root canals.⁸ Although the etiology of this anomaly is unknown, an in growth of tissue from Hertwig's epithelial root sheath, trauma or other disturbances during morphodifferentiation may affect root form and size in later periods.⁹ In the present case, however, there was no history of trauma.

The prevalence of anatomical variations documented in the present study makes it imperative for analyzing the possibilities of variations in root canal anatomy of mandibular canines. These aberrations, further demands the need for proper diagnosis, treatment planning and careful execution of the treatment modality. The clinician must be familiar with the anatomic variations encountered in different teeth and must prudently execute the endodontic procedure by good tactile sensation explore for these variations in every tooth using state of art technology such as:

- I. *Multiple radiographs*: Well angulated periapical films should be taken. (Mesio-angular, disto-angular, straight) when evaluating an endodontic failure.
- II. *Digital radiography*: This affords a variety of software features, significantly enhancing radiographic diagnostics in identifying hidden, calcified or untreated canals.
- III. *Visual enhancers*: Magnifying glasses, head lamps, transilluminating devices, dental operating microscopes are used to improve visualization.
- IV. *Coronal flaring*: This should be done for better visualization of canal orifice.

- V. *White line test*: Shelf of dentin meets the pulpal floor and forms a groove. It forms a visible road map that can be followed and explored to find canal orifice.
- VI. *Red line test*: In vital cases, blood flows into the orifices, fins and isthmus areas thus serving as a road map for identification of canal orifices.
- VII. *Surgical length burs*: They enhance direct vision by moving the head of the handpeice further away from the occlusal table and improving the line of sight along the shaft of the bur.
- VIII. *Piezoelectric ultrasonic*: Troughing of grooves with ultrasonic tips (CPR tips).
- IX. Examination of the pulp chamber floor with a sharp explorer (DG 16)
- X. *Dyes*: 1% methylene blue dye is irrigated into the pulp chamber and subsequently rinsed thoroughly with water, dried and visualized to see where the dye has been absorbed. Frequently the dyes will be absorbed into the orifices, fins and isthmus areas
- XI. *Champagne bubble test* using Sodium Hypochlorite: After cleaning and shaping procedures, the access cavity is flooded with NaOCl and the solution is observed to see if bubbles are emanating toward the occlusal table from canal orifice. A positive bubble reaction signifies that NaOCl is -reacting with residual tissue within the instrumented or the missed canal. or with the residual chelator present within the prepared canal.
- XII. *Ruddle's solution*: This irrigant is a "cocktail" containing 5% sodium hypochlorite (NaOCl), Hypaque and 17% EDTA. Hypaque is a water soluble, radiopaque, contrast solution which can be utilized to visualize root canal system anatomy, monitor the remaining wall thickness during preparation procedures, detect pathological defects and manage iatrogenic mishaps. The composition of the Ruddle Solution simultaneously provides the "solvent action" of full-strength NaOCl, "visualization" as its radiopacity closely matches that of gutta-percha and improved "penetration" as the tension-active agent lowers the surface tension.⁹

The fact that the mandibular canines generally present a single root and a single canal led in the past to the belief that this is the only anatomical possibility.¹⁰ However, case reports⁶⁻⁸ have shown that these teeth also may present different anatomic configurations, including two separate roots or a single root with two canals. The use of multi-angled diagnostic radiographs and operating microscope may be very useful in the diagnosis and treatment of such cases.

In this case report, it was the careful evaluation of the radiograph taken prior to and during endodontic therapy that facilitated the recognition of the complex canal morphology.

CONCLUSION

A thorough knowledge of the root canal anatomy, careful interpretation of the radiographs, proper modification of the conventional access cavity are the essentials for recognition and adequate treatment of these anatomical variations. Every tooth has to be treated as an exception and the pulp chamber explored for an additional canal.

Acknowledgement

We thank Late Dr. Gururaj Nadig for his guidance and support.

References

1. Pineda F, Kutler Y. Mesiodistal and buccolingual roentgenographic investigations of 7,275 root canals. *Oral Surg, Oral Med, Oral Path.* 1972; 33:101-10.
[doi:10.1016/0030-4220\(72\)90214-9](https://doi.org/10.1016/0030-4220(72)90214-9)
2. Bellizzi R, Hartwell G. Clinical investigation of in vivo endodontically treated mandibular anterior teeth. *J Endod.* 1983; 9:246-8.
[doi:10.1016/S0099-2399\(86\)80022-X](https://doi.org/10.1016/S0099-2399(86)80022-X)
3. Caliskan MK, Pehivan Y, Sepetcioglu F, Tuncer SS. Root canal morphology of human permanent teeth in a Turkish population. *J Endod.* 1995; 21:200-4.
[doi:10.1016/S0099-2399\(06\)80566-2](https://doi.org/10.1016/S0099-2399(06)80566-2)
4. Vertucci FJ. Root canal anatomy of the human permanent teeth. *Oral Surg, Oral Med, Oral Path.* 1984; 58:589-99.
[doi:10.1016/0030-4220\(84\)90085-9](https://doi.org/10.1016/0030-4220(84)90085-9)

5. Jesus Djalma, Manoel D. SN, Paulo Cesar S. Internal anatomy, direction and number of roots and size of human mandibular canine. *Braz Dent J.* 1993; 4:53-7.
6. Slowey RR. Radiographic aids in detection of extra root canals. *Oral Oral Surg, Oral Med, Oral Path.* 1974; 37:762-71.
[doi:10.1016/0030-4220\(74\)90142-X](https://doi.org/10.1016/0030-4220(74)90142-X)
7. D'Arcangelo C, Varvara G, De Fazio P. Root canal treatment in mandibular canines with two roots- A report of two cases. *Int. Endod J.* 2001; 34:331-4.
[doi:10.1046/j.1365-2591.2001.00376.x](https://doi.org/10.1046/j.1365-2591.2001.00376.x)
PMid:11482146
8. Holtzman L. Root canal treatment of a mandibular canine with three root canals. Case report. *Int. Endod J.* 1997; 30:291-3.
[doi:10.1111/j.1365-2591.1997.tb00711.x](https://doi.org/10.1111/j.1365-2591.1997.tb00711.x)
PMid:9477817
9. Siqui A. Etiology of root canal treatment failure: why well-treated teeth can fail. Review. *Int. Endod J.* 2001; 34(1):1-10.
[doi:10.1046/j.1365-2591.2001.00396.x](https://doi.org/10.1046/j.1365-2591.2001.00396.x)
PMid:11307374
10. Heling, I. Gottlieb-Dadon, N. P. Chandler. Mandibular canine with two roots and three root canals. *Dent Traumatol.* 1995; 11; 301-2.
[doi:10.1111/j.1600-9657.1995.tb00509.x](https://doi.org/10.1111/j.1600-9657.1995.tb00509.x)

Corresponding Author

Dr. Sandhya Kapoor Punia MDS

House No.- 13-14, Shantivan Colony,
Near Alok School, Bedla Road, Fatehpura,
Udaipur, India.

Phone Number: +919660987078

E-mail: drsanvikpunia@gmail.com