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Case Series

Quest for hidden alley- hide & Seek in mandibular anteriors

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ABSTRACT

Failure is the good teacher than success. When returning to the root canal system for retreatment, there is always a lesson to be learned. An often cited reason for endodontic failure is the inability to identify, access, treat, and fill every single canal. Mandibular incisor teeth are not an outlier to this rule. Mandibular incisors are one such tooth which is regarded as least difficult for endodontic treatment. But the intricacy of the mandibular incisors internal anatomy presents us with various challenges during root canal treatment. Prevention of missing anatomy commences with adequate pre-operative radiographs, notwithstanding the limitations of radiography in estimating the number of canals and the presence of auxiliary canals and anastomoses. Without a second thought, a correct access cavity preparation is crucial to localising the root canal orifices, and this also calls for a comprehension of the tooth's internal architecture. This case series highlights the non- surgical endodontic retreatment of mandibular incisors with missed canal.

1. Introduction

Problems or setbacks during endodontic therapy might be the result of a lack of knowledge about the anatomy of the pulpal region. It is important to understand and be able to visualize the internal anatomy before the root canal treatment.[1] One of the reasons for apical periodontitis after treatment is that the clinician may not be able to locate all the root canals. Even if the canals are not infected initially, a missed canal can become a potential site to harbor enough bacteria leading to infection.[2] According to the study by Costa et al, Teeth with atleast one untreated canal were 6.25 times more likely to be associated with apical periodontitis.[3] Missed canal often misleads the treatment plan.

Teeth with a single root are often considered to be the least challenging teeth for endodontic treatment. Mandibular central and lateral incisor have very similar morphology. They often have three pulp horns and one root. However anatomy of the root canal of mandibular inscisors is not as straightforward as it appears on periapical radiographs. There is a wealth of documented information supporting anatomical variation and discrepancies in morphology and canal configurations of mandibular anteriors.[4] A study by Bramhecha et al states that the most common canal configuration observed in mandibular central and lateral incisors was Vertucci Classification Type III, followed by Type I.[1] This case series highlights the Non-surgical retreatment of mandibular anterior with a missed canal.

2. Case Report 1

A 31-year-old female patient reported with the chief complaint of pain and discolored tooth in the lower front tooth region for past 6 months. She had undergone root canal treatment 4 year ago. Patient's medical history was

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noncontributory. On clinical examination, discoloration and dislodged restoration observed in relation to 31. Pain on percussion was present and periodontal probing depth was within normal limits with physiological mobility. Pulp vitality testing (COXO C Pulse Pulp Tester) gave no response with 31. Radiographic images (Carestream CS 2100, Atlanta, USA) revealed linear radiopacity in coronal and radicular portions suggestive of an obturating material with diffuse periapical radiolucency (Figure 2A). Applying SLOB rule, mesially angulated radiograph revealed the linear radiolucency adjacent to the linear radiopacity suggestive of missed canal (Figure 2B). Diagnosis of previously root canal-treated teeth with symptomatic apical periodontitis was arrived at. Treatment plan was to perform Non-surgical endodontic retreatment in relation to 31. Written Informed consent was obtained from the patient and treatment initiated.

All coronal restorations were removed in relation to 31, the local anesthesia with 2% lidocaine and 1:80,000 epinephrine was established and the rubber dam (Coltene Whaledent Pvt. Ltd.) was placed. A careful examination of the pulp chambers under dental magnifying loupes (Admetec, Haitech Solutions Pvt. Ltd) revealed single orifice in 31(Figure 2C). The root canal filling was removed with GP Solvent (RC Solve, Prime Dental Products Pvt Ltd) and ProTaper retreatment rotary files (DENTSPLY Maillefer, Ballaigues, Switzerland. The working length was re-established with Root ZX II (J. Morita, Tokyo, Japan) with 15 size K file and confirmed radiographically. Careful observation of radiograph revealed a canal configuration of Vertucci classification Type V (Figure 2D). Instrumentation was done with protaper gold to the size F2. Irrigation was done with 5.25% sodium hypochlorite (Prime Dental Products Pvt Ltd) and 17% EDTA (Prime Dent Wash, Prime Dental Products Pvt Ltd). The canals were irrigated with normal saline after each change of instrument. Final flush of irrigation with nomal saline was done and the canals were dried with sterile paper points. Canals were irradiated with 940- nm diode laser 200-μm fibre tip 1–1,3 W cw 4 $\times$ 2 mm/s per canal circular movement from apex to crown (Figure 2E). Obturation was done with Gutta percha cone and bioceramic sealer(MTA FILLAPEX, Angelus) using a single cone technique (Figure 2F). Final restoration was done using composite resin (Coltene, Whaledent) (Fig 2.G).At 1 year follow-up, patient was clinically asymptomatic and radiographic sign of periapical healing seen (Figure 2H).

3. Case Report 2

A 52-year-old male patient reported with the chief complaint of pain in the lower front tooth region for past 3 month. He had undergone root canal treatment 1 year ago. Patient's medical history was noncontributory. On clinical examination, Dislodged restoration was noted lingually with 42 and attrited tooth in relation to 41, 31, 32. Pain on percussion was present and periodontal probing depth was within normal limits with physiological mobility. Pulp vitality testing (COXO C PULSE PULP TESTER) gave no response with 42 and positive response in relation to 41, 31, 32. Intraoral periapical radiograph (Carestream CS 2100, Atlanta, USA) revealed linear radiopacity in coronal and radicular portions suggestive of an obturating material short of the apex with diffuse periapical radiolucency. Applying SLOB rule, mesially angulated revealed the linear radiolucency adjacent to the linear radiopacity. Diagnosis of previously root canal-treated teeth with asymptomatic apical periodontitis was arrived at. Treatment plan was to perform Non-surgical endodontic retreatment in relation to 42. Written Informed consent was obtained from the patient and treatment initiated.

The treatment protocol followed was the same as discussed in case report 1 Careful observation of radiograph revealed a canal configuration of Vertucci classification Type II. All canals were negotiated, cleaned, and shaped and the obturation was completed. At 1 year followup, patient was clinically asymptomatic and radiographic sign of periapical healing seen (Figure 3A-F).

4. Case Report 3

A 41-year-old female patient reported with the chief complaint of pain in the lower front tooth region for past 3 month. Patient's medical history was noncontributory. Her dental history revealed that she had undergone root canal treatment 6 months ago. On clinical examination, dislodged restoration was noted lingually with 31. Pain on percussion was present and periodontal probing depth was within normal limits with physiological mobility. Pulp vitality testing (COXO C Pulse pulp tester) gave no response with 31. Intra oral periapical radiographic images (Carestream CS 2100, Atlanta, USA) revealed linear radiopacity in coronal and radicular portions suggestive of an obturating material short of the apex with diffuse periapical radiolucency. Applying SLOB rule, mesially angulated revealed the linear radiolucency adjacent to the linear radiopacity suggestive of missed canal. Diagnosis of previously root canal-treated teeth with symptomatic apical periodontitis was arrived at. Treatment plan was to perform Non-surgical endodontic retreatment in relation to 31. Written informed consent was obtained from the patient and treatment initiated.

The treatment protocol followed was the same as discussed in case report 1. Careful observation of radiograph revealed a canal configuration of Vertucci classification Type II. All canals were negotiated, cleaned, and shaped and the obturation was completed.(Figure 4 A-F)

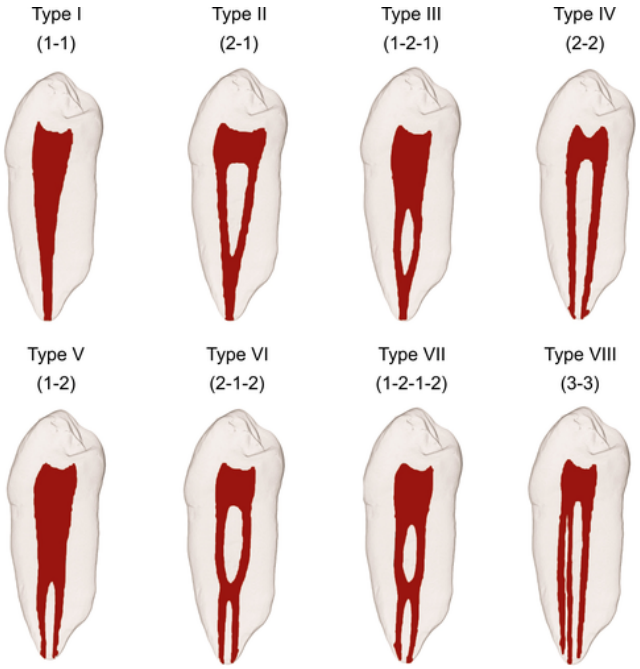

Figure 1: Diagrammatic representations of Vertucci's classification for root canal morphology (Vertucci et al. 1974)[5]

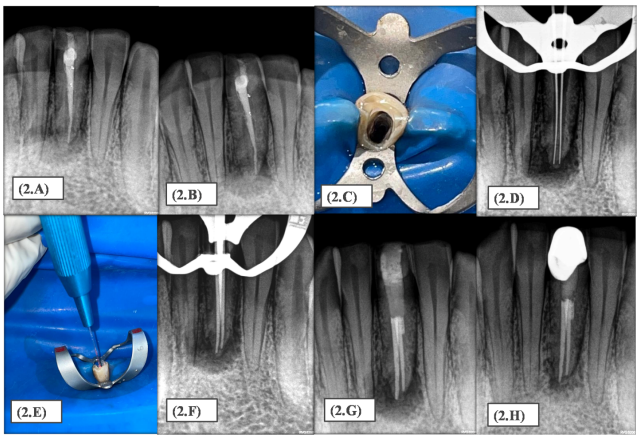

Figure 2: Case report 1: Missed canal in mandibular central incisor (31); **A:** Pre- operative radiograph; **B:** Mesially angulated radiograph revealing the missed canal; **C:** Access cavity preparation; **D:** Working length determination; **E:** Diode laser canal disinfection; **F:** Mater cone GP fit radiograph; **G:** Post operative radiograph; **H:** Follow-up radiograph at 1 year followup

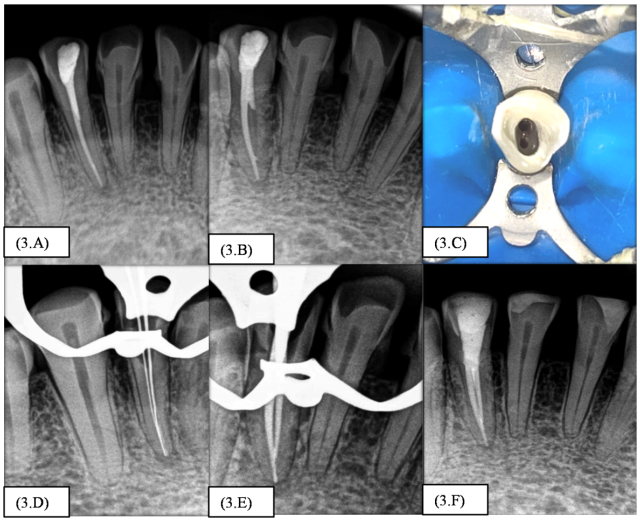

Figure 3: Case report 2: Missed canal in Mandibularlaterial incisor (42); **A:** Pre- operative radiograph; **B:** Mesially angulated radiograph revealing the missed canal; **C:** Access cavity preparation; **D:** Working length determination; **E:** Master cone GP fit radiograph; **F:** Post-operative radiograph at 1 year follow-up

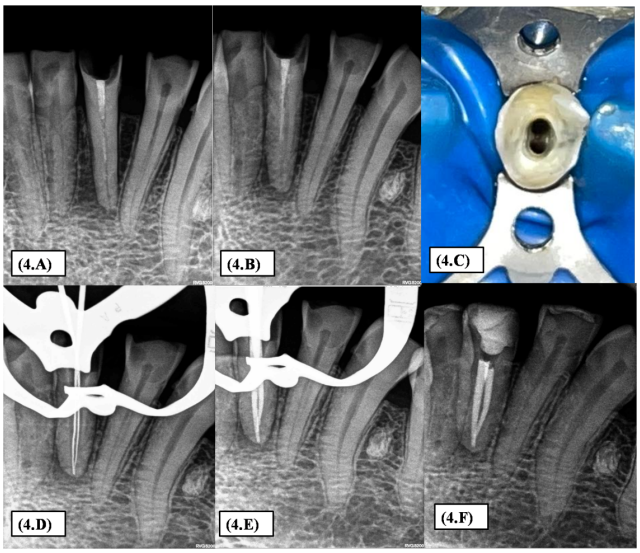

Figure 4: Case report 3: Missed canal in Mandibular central incisor (31); **A:** Pre- operative radiograph; **B:** Mesially angulated radiograph revealing the missed canal; **C:** Access cavity preparation; **D:** Working length determination; **E:** Master cone GP fit radiograph; **F:** Post operative radiograph at 1 year follow-up

5. Discussion

Mandibular incisors have a lingual canal that is often overlooked, despite having consistent and uncomplicated root canal morphology. In contrast to the buccal canal, the lingual canal is typically concealed behind the cingulum, making it difficult to detect with periapical radiographs and necessitating extensive dentinal bulge reduction. A lack of lingual canal management may result in endodontic failure.[6]

Superior-quality preoperative periapical radiographs with multiple horizontal projections assist in recognizing root canal morphology and the outline of the periodontal ligament, which helps with the interpretation of internal and external root anatomy, even with the built-in constraints of conventional radiographic views providing 2D images of 3D objects.[7] 3D imaging was not done in all three cases where morphology of root canal predicted by SLOB rule.

Accurately preparing the access cavity is crucial for identifying the root canal orifice locations. But in order to locate hidden canals, one needs a sufficient armamentarium ; a dental operating microscope and/or high-power loupes combined with a headlight system will improve illumination and visibility, while long shank round burs with small shaft diameters and ultrasonic tips will enable a careful and controlled removal of calcium deposits and other obstructions to the canal orifices.[8–10]

Single-appointment root canal retreatment's showed a favorable success rate, according to the study by Eyuboglu et al., thus explaining why single visit root canal treatment was performed in all cases. Furthermore, the study reported remarkable healing of periapical lesions less than 5 mm in size.[11] The use of laser as an adjuctive aid in disinfection in our situation is explained by the research conducted by Ezaby et al. that claims adjunctive use of 980 nm diode laser intracanal irradiation can better eradicate the E. faecalis bacteria from the infected root canals and decrease the bacterial recolonization.[12] LASER use in the disinfection of the root canal have been studied by Jambagi et al which claims that the Diode laser disinfection showed the highest reduction of microbial count in root canal compared to ultrasonic activated and conventional needle irrigation with 2.5% NaOCl group.[13] Recent study by Laís Lima et al[14] also claimed that diode laser facilitated the periapical repair from 3- to 12-month follow-up ($P < 0.05$) and had 45% more healed cases than placebo.

A study by Farzana et al[15] states that Bioceramics based sealer seems to be more effective than calcium hydroxide based sealer in repair of periapical lesions of the non-vital teeth. Hence MTA based sealer are used to enhance the periapical healing in all the three cases

6. Conclusion

A tooth is never the same twice. Every tooth discloses hidden alleys that require the most intricate understanding of the anatomy of the root canal. Although mandibular incisors are typically regarded to be the least difficult to treat with root canal therapy, their intricate architecture can provide numerous difficulties for Endodontists. To win this hide-and-seek game and to avoid missed canals, an appropriate radiographic analysis and access cavity modification with appropriate armamentarium employment are required.

7. Source of Funding

None.

8. Conflict of Interest

None.

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