Case Reports in Dental Science

Case Report | Vol 2 Iss 2

Procedural Error Management in Mandibular Anterior Teeth: Case Reports Series

Urvashi B. Sodvadiya, Gowrish S* and Mithra Nidarsh Hegde

Department of Conservative Dentistry and Endodontics, AB Shetty Memorial Institute of Dental Science, NITTE (Deemed to be University), Karnataka, India

Correspondence should be addressed to Gowrish S, gsbhatmlore@gmail.com

Received: May 10, 2021; Accepted: May 29, 2021; Published: June 4, 2021

ABSTRACT

The success of endodontic treatment depends on the knowledge of a clinician about the morphology of the external and internal structure of the tooth. Due to the complex and diverse anatomy of the root canal system, the possibility of an error during the treatment increases. However, the clinician should be aware of the treatment options and the material aspects involved in the treatment of such conditions. This case report discusses the different root canal morphology seen in mandibular anteriors and, preventive and treatment aspect of procedural errors frequently seen during endodontic treatment. Careful radiographic examination before initiating treatment, exploration of pulp chamber during the treatment, and post-operative radiographic assessment should be carried out to minimize the risk of the missed canal. The higher possibility of perforation in mandibular anteriors could be due to their smaller dimension. However, the identification and treatment of perforation can improve the overall prognosis if it is carried out at the initial stage.

KEYWORDS

Mandibular anterior; Root canal configuration; Perforation; Missed canal; Procedural errors

INTRODUCTION

A comprehensive and systematic methodology is the primary determinant to achieve bacterial elimination from the root canal system and to avoid potential bacterial encroachment. When these measures are considered, the success rate of endodontic treatment is as high as 94% [1]. Owing to complex anatomy and variation from person to person, procedural errors during endodontic therapy occur not only with students and beginners but also with trained and experienced practitioners despite taking every possible precaution.

In the literature, teeth with single root canals are least affected by procedural errors [2]. Mandibular anteriors were considered as teeth with a single canal until Rankine and Henry (1965) reported a higher incidence of two canals in mandibular anteriors [3]. In the Indian population, the incidence of two canals ranges from 28%-33% [4,5]. Before initiating root canal treatment, root canal morphology should be studied to reduce the chances of procedural errors. Poor technique can result in different procedural errors which may have severe consequences.

Citation: Sodvadiya Urvashi B, Procedural Error Management in Mandibular Anterior Teeth: Case Reports Series. Case Rep Dent Sci 2(2): 46-51.

Such procedural errors can be categorized based on the steps of endodontic treatment.

Prevention of these procedural errors is critical for the effectiveness and success of endodontic treatment. However, it is also important for a clinician to have the skill to identify and treat these errors as early as possible. This article aims to emphasize the importance of early detection and treatment intervention of procedural errors related to access opening, specifically in the mandibular anterior teeth.

CASE REPORT

Case 1

A 36-years-old Indian male patient reported with a chief complaint of pain in the lower front teeth region. A detailed history was taken to understand the character of pain. A patient had experienced an occasional low-grade intermittent dull pain for one month. Medical and dental history was unremarkable. No extra-oral swelling or pain was reported.

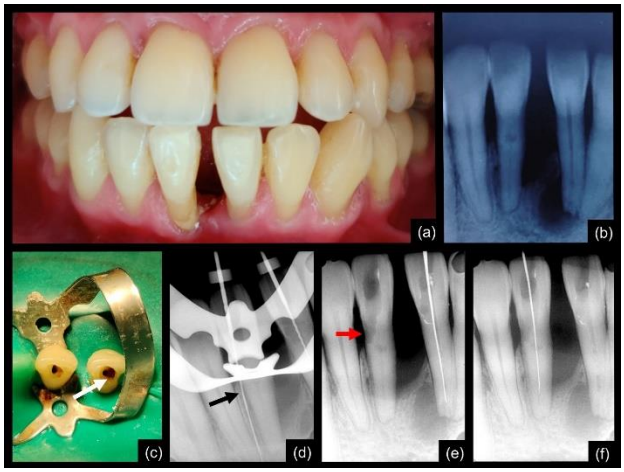

Figure 1: (A and B) Clinical and radiographic presentation of mandibular right and left central incisors (31,41). **(C and D)** Clinical picture and periapical radiograph showing the presence of cervical perforation (arrows representing the location of perforation). **(E and F)** Periapical radiograph displaying working length estimation of 31 and 41.

Intraoral examination revealed a localized inflammation in the attached gingiva in relation to the mandibular right (41) and left central (31) incisors (Figure 1A). No intraoral draining sinus was reported. Gingival recession was observed in tooth number 31 and 41. Initial periodontal probing revealed the presence of a deep periodontal pocket of 5 mm and 4 mm and bleeding sulcus in relation to tooth number 31 and 41, respectively. Gingiva was tender on palpation. Further examination revealed grade 2 mobility and tenderness on palpation in relation to tooth number 31 and 41. The patient had traumatic occlusion with an edge-to-edge incisal position. The oral hygiene status of the patient was fair. Rest all the teeth showed no clinical sign of decay, trauma, or fracture. The patient was in good general health, had never smoked, and did not take any medications.

Radiographic examination revealed an extensive interdental bone loss in relation to tooth number 31 and 41. Periapical radiolucency was observed in relation to tooth number 31 whereas lateral radiolucency of the tooth was present in relation to tooth number 41 (Figure 1B). Additionally, radiolucency was present in the coronal third of the root surface of tooth number 41 indicating a case of internal resorption. Also, there was a widening of periodontal ligament space in relation to tooth number 41. Pulp sensibility tests (thermal and electrical tests) were performed with respect to tooth number 41 and 31 and no responses were recorded. Hence, a diagnosis was reached to pulp necrosis with symptomatic apical periodontitis in relation to tooth number 31 and 41. Due to the compromised periodontal and occlusal condition, treatment options consisted of endodontic treatment followed by periodontal therapy and occlusal correction. The treatment plan was discussed with the patient and upon agreement, the treatment was initiated.

After obtaining informed consent, full-mouth scaling was done. For the area of chief complaint (mandibular anterior quadrant), the patient received root planning four times at intervals of 1-week over four consecutive sessions. Systemic antibiotics (amoxicillin (500 mg) and clavulanic acid (125 mg) and metronidazole 400 mg, both three times a day for 5 days) were prescribed. The patient was advised

to rinse with a 0.2% chlorhexidine solution twice daily. Simultaneously, after the first session of SRP, the endodontic treatment was initiated. Local anesthesia was carried out using 2% lidocaine and 1:100,000 epinephrine. The preoperative occlusal reduction was done to reduce the trauma from occlusion. Access cavity preparation was done under rubber dam isolation (Hygienic Dental Dam, Coltene Whaledent Inc., Germany) with respect to tooth number 31 and 41 using small No 4 round bur. While preparing access, flooding of blood was noticed in the access cavity of tooth number 41 and the cervical perforation was suspected (Figure 1C). To verify, a radiograph was taken after placing K type (Mani Inc., Japan) file in the site of bleeding. After taking a radiograph, the presence of iatrogenic cervical perforation was confirmed (Figure 1D). The orientation of the bur was changed, and access was regained with respect to 41. Working length was determined radiographically for tooth number 31 and 41 (Figure 1E and Figure 1F). Shaping and cleaning of tooth number 31 and 41 were performed using K type (Mani Inc., Japan) hand instruments till size #40 and #30 respectively. Canals were irrigated using 3% Sodium hypochlorite and saline in between to prevent the blockade of the canals. Following master apical fit verification (Figure 2A), cervical perforation was sealed using Glass Ionomer cement (Figure 2B) and was verified radiographically (Figure 2C). Excess cement from the canal orifice was removed using the H type hand instrument (Mani Inc., Japan). Canals were dried using sterile paper points, and Calcium hydroxide (AvueCal, Dental Avenue, India) was placed as an intracanal medicament for 2 weeks.

In the next appointment, the patient was asymptomatic. Teeth were isolated in the same manner as before. Canals were irrigated using 3% Sodium Hypochlorite and 17% Ethylene diamine tetraacetic acid (EDTA), and the final saline wash was done. Canals were dried using sterile paper points and obturation was done using gutta-percha and bioceramic based sealer (BioRoot™ RCS, SeptoDont, India) (Figure 2d). The access cavity was restored using composite resin.

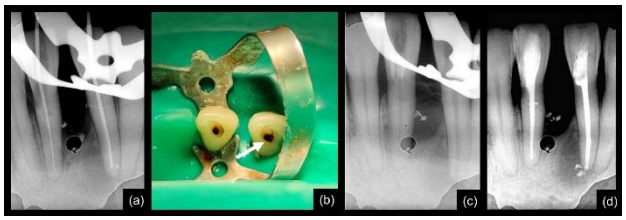

Figure 2: (A) Periapical radiograph showing the master apical fit of gutta-percha cone. **(B and C)** Clinical and radiographic presentation of sealed cervical perforation in relation to 41. **(D)** Postoperative periapical radiograph showing obturation of 31 and 41.

Case 2

A 24-years-old Indian male patient reported with a chief complaint of discomfort in the lower front teeth region. The patient had experienced episodes of low-grade intermittent dull pain occasionally. However, the patient was asymptomatic on the day of examination. No systemic significant finding was reported. There was no history of any previous dental treatment.

Intraoral examination revealed intact lower anteriors. No soft tissue and hard tissue findings were noticed. The oral hygiene status of the patient was good. All maxillary and mandibular teeth showed no clinical sign of decay, trauma, or fracture. Thermal and electrical pulp tests were performed with respect to all lower anterior. Except for lower left central incisor (31), all the teeth presented with a normal response.

Diagnosis of asymptomatic apical periodontitis was reached in relation to tooth number 31. Treatment options were explained to the patients, informed consent was obtained to perform pulp space therapy of tooth number 31. Local anesthesia was carried out using 2% lidocaine and 1:100,000 epinephrine. Access opening was performed under the rubber dam isolation (Hygienic Dental Dam, Coltene Whaledent Inc., Germany) in relation to tooth number 31. A careful examination of the pulp chamber revealed one wide opening of the canal. Upon exploration of the canal using a small size K type

instrument, the bifurcating canal was in a midway. While estimating the working length radiographically, it was observed that bifurcated canals exited as 2 distinct canals apically (Figure 3A and Figure 3B). Shaping and cleaning was performed using K type (Mani Inc., Japan) hand instruments and, 3% Sodium hypochlorite. Calcium hydroxide paste (AvueCal, Dental Avenue, India) was placed as an intracanal medicament after drying the canals using sterile paper points. The patient was reappointed after 2 weeks for the completion of the treatment.

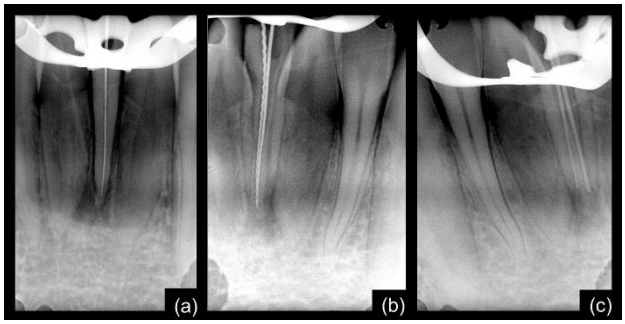

Figure 3: (A and B) Periapical radiograph showing the working length estimation of 31 from two different angulations. **(C)** Radiographic confirmation of master apical fit in relation to 31.

In the next appointment, the patient reported that he was free of pain. Canals were irrigated, cleaned, and dried under the rubber dam isolation. The apical fit of the gutta-percha cones was confirmed radiographically (Figure 3C). Obturation was performed using gutta-percha and calcium hydroxide-based sealer (Sealapex, Sybron Endo, USA). The access cavity was restored using Glass ionomer cement. To verify the obturation, radiographs were taken from 2-different angulation. Upon radiographic examination, a missed lingual canal was noticed (Figure 4A and Figure 4B). Glass ionomer cement was removed from the access cavity immediately. To gain straight-line access to the lingual canal, the access cavity was widened buccolingual (Figure 4C). The obturation of the lingual canal was done in the same way as for the buccal canal. The access cavity was restored using glass ionomer cement (Figure 4D). A postoperative radiograph was taken and was evaluated by a specialist endodontist with 15 years' experience.

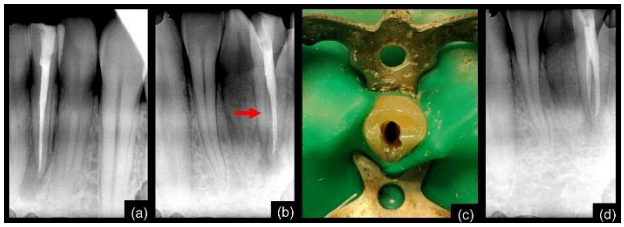

Figure 4: (A) Postoperative periapical radiograph showing obturation of 31. **(B)** Periapical radiograph taken by shifting the cone mesially reveals the missed lingual canal in relation to 31 (arrow representing the missed lingual canal). **(C)** Clinical picture of 31 with widened access opening to gain straight-line access to the lingual canal. **(D)** Postoperative periapical radiograph showing obturation of both the canals in relation to 31.

DISCUSSION

Prognosis of the root canal treatment can be affected by multiple factors such as the preoperative condition of the tooth and supporting structure, procedural errors, oral hygiene status, etc. Among all the factors, procedural errors can be prevented by performing each step of root canal treatment in a standardized and systemic manner.

Prognosis of the tooth with cervical perforation depends on the size and location of the perforation, bacterial contamination, and material used [6]. In the present case (Case 1), perforation was sealed on the same appointment to reduce the chances of inflammatory changes. To prevent bacterial contamination in case of cervical perforation, sealing of the perforation should be carried on the same day under rubber dam isolation [7]. According to Torabinejad and Chivian, MTA is the material of choice to seal the perforation due to its sealing ability and capability to form mineralized tissue [8]. In the present case, Glass ionomer cement was used to seal the perforation because of its chemical bonding capability to dentin and cementum, fluoride release property, and acceptable biocompatibility [9].

To avoid perforation, the path and penetration depth of the access bur should be confirmed. The preoperative radiograph should be studied thoroughly to analyze the

pulp chamber morphology. In cases of pulp canal calcification, 2-dimensional radiographs can be used for the preoperative visualization of the 3-dimensional root canal system. Munce access refinement bur, ultrasonic tips, and c-plus files can be used to trough the calcified chamber and, to locate and negotiate the calcified canals after reaching the approximate depth in the pulp chamber. Magnification in terms of magnifying loupes and dental operating microscope is considered an integral part of endodontic practice. Since improved magnification and illumination make it possible for a dentist to avoid and control procedural errors [10].

Due to inadequate knowledge about root canal configurations and variants of root canal anatomy, the risk of being unable to locate the canal during endodontic practice increases. The incidence of two canals in mandibular anteriors is 13%-30% [4,11]. In the Indian population, if the configuration of the mandibular central incisor is considered to be specific, the type II Vertucci (11.3%) is frequently reported after type I, the type V (3.6%) is the least commonly encountered [4].

In the present case, Vertucci's type V configuration was reported. A preoperative radiograph should be obtained from two different angulations to reveal the anatomy of pulp space. Clinically, careful exploration of the pulp chamber discloses the type of canal configuration present. For instance, a round-shaped canal orifice is frequently associated with type I configuration whereas an oval-shaped canal orifice increases the probability of splitting a canal into two separate canals. In such cases, exploration of the canal using a small K type hand instrument may help to negotiate the bifurcating canal. When two separate orifices are present, the distance between the two orifices is also important. If they are located closer to each other, there is a greater risk that the canals will be joined somewhere in the root body. The use of DG-16 endodontic explorer and JW-17 endodontic explorer helps to locate and determine the angulation of the canal [12].

In the present case, the canal orifice was not widened sufficiently to allow straight-line access to the lingual canal. As a result, difficulties were encountered while introducing the gutta percha cone in the lingual canal. However, after enlarging the orifice, straight-line access was gained and obturation was performed adequately. Before initiating an endodontic procedure, the clinician should have a thorough knowledge of root canal anatomy and should be aware of his/her ability to treat the condition if any mishaps occur.

CONCLUSION

Variation in root canal anatomy is not uncommon. Failure to recognize the variation can result in a procedural error. The clinician should have adequate knowledge to identify such errors if occur. Adequate knowledge about the use of appropriate material and techniques in a certain situation may also affect the prognosis of the tooth. Further studies are required to identify the long-term outcome of treated/ untreated procedural errors.

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil.

CONFLICTS OF INTEREST

There are no conflicts of interest.

ACKNOWLEDGEMENT

The authors thank the Endodontic department at the AB Shetty Memorial Institute if Dental Sciences for the resources during the treatment of this case.

REFERENCES

1. Nimura N, Pinheiro ET, Gomes BP, et al. (2007) The outcome of endodontic treatment: A retrospective study of 2000 cases performed by a specialist. Journal of Endodontics 33(11): 1278-1282.
2. Yousuf W, Khan M, Mehdi H (2015) Endodontic procedural errors: Frequency, type of error, and the most frequently treated tooth. International Journal of Dentistry 2015: 673914.
3. Rankine-Wilson RW, Henry P (1965) The bifurcated root canal in lower anterior teeth. The Journal of the American Dental Association 70(5): 1162-1165.
4. Aminsobhani M, Sadegh M, Meraji N, et al. (2013) Evaluation of the root and canal morphology of mandibular permanent anterior teeth in an Iranian population by cone-beam computed tomography. Journal of Dentistry (Tehran, Iran) 10(4): 358-366.
5. Kamtane S, Ghodke M (2016) Morphology of mandibular incisors: A study on CBCT. Polish Journal of Radiology 81: 15-16.
6. Saed SM, Ashley MP, Darcey J (2016) Root perforations: Aetiology, management strategies and outcomes. The hole truth. British Dental Journal 220(4): 171-180.
7. Sinai IH (1977) Endodontic perforations: Their prognosis and treatment. The Journal of the American Dental Association 95(1): 90-95.
8. Torabinejad M, Chivian N (1999) Clinical applications of mineral trioxide aggregate. Journal of Endodontics 25(3): 197-205.
9. Behnia A, Strassler HE, Campbell R (2000) Repairing iatrogenic root perforations. The Journal of the American Dental Association 131(2): 196-201.
10. Low JF, Dom TN, Baharin SA (2018) Magnification in endodontics: A review of its application and acceptance among dental practitioners. European Journal of Dentistry 12(04): 610-616.
11. Kaffe I, Kaufman A, Littner MM, et al. (1985) Radiographic study of the root canal system of mandibular anterior teeth. International Endodontic Journal 18(4): 253-259.
12. Berman LH, Hargreaves KM (2015) Cohen's pathways of the pulp expert consult-e-book. Elsevier Health Sciences.