CASE REPORT

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Inferior alveolar nerve damage after extrusion of an endodontic sealer into the mandibular canal: a case report

Zeliha Yılmaz, Emel Uzunoğlu, Özge Erdoğan

Department of Endodontics, Hacettepe University Faculty of Dentistry, Ankara, Turkey

The aim of this case report was to discuss the consequences and treatment options of inferior alveolar nerve damage after the overextension of an endodontic sealer into the mandibular canal. A 33-year-old female patient was referred to the clinic of endodontics with persistent numbness around her left commissura as a consequence of her initial endodontic treatment of a lower left first molar. The patient's complaints started to occur after the anesthesia has worn off. An endodontic sealer was extruded and spread into the mandibular canal, which caused anesthesia, paresthesia and tingling sensation around the left part of lower lip. Performing an interdisciplinary framework with the department of oral surgery, it was decided to monitor the patient regularly without any surgical intervention in order not to cause more trauma to the inferior alveolar nerve and not to jeopardize the present health status of the patient. Although damage to the inferior alveolar nerve is a relatively rare complication in dental practice, long-lasting consequences of such a complication stress the significance of showing absolute attention and care during all endodontic.

Keywords: Inferior alveolar nerve; paresthesia; root canal sealer.

The essential steps for successful endodontic treatment consist of elimination of all diseased pulp and dentin tissues, adequate chemomechanical preparation and filling of the root canal system hermetically.[1] Moreover, it is crucial that root canal obturation has to be limited within root canal system. Minor apical foramen or minor apical constriction is known to be situated 0.5–1.5 mm coronally to the apical foramen and endodontic treatment is suggested to be finished in this constricted region.[2] A small wounded surface is created when endodontic procedures are restricted within the root canal system, as a result extrusion of the toxic constitutes of obturation materials beyond apical foramen is prevented. What is more, with the activation of the immune system, healing is elicited rapidly. On the other hand, accidental extrusion of canal ingredients may result in postoperative pain and delayed healing.[3–5]

Miscalculation of working length, procedural errors, anatomical and morphological variations may cause apical extrusion even to the anatomical landmarks such as maxillary sinus and mandibular canal. Direct contact of the nerve with extruded materials may result in some abnormal sensations such as anesthesia, paresthesia, hypoasthesia and dysesthesia.[3,6–10]

The present case report discusses the causes and treatment options of inferior alveolar nerve damage following the overextension of an endodontic sealer into the mandibular canal.

Correspondence: Dr. Emel Uzunoğlu. Hacettepe Üniversitesi Diş Hekimliği Fakültesi, Endodonti Anabilim Dalı, Ankara, Turkey.
Tel: +90 312 – 305 22 60 e-mail: emel_dt@hotmail.com
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Case report

A 33-year-old female patient was referred to department of endodontics in March 2014. Her dental anamnesis revealed a root canal treatment for her lower left first molar in a private clinic 13 months ago. The numbness around her left commissura had begun right after the anesthetic worn off. In the panoramic radiograph taken the next day following treatment (Figure 1a), a radiopaque root canal obturation paste was observed in the mandibular canal. Her dentist prescribed Vitamin B12 for two months; however, the paresthesia didn't improve.

The Medical history revealed, chemotherapy and radiotherapy following surgery due to breast cancer in 2010. She was on Tamoxifen 10 mg twice a day since then.

No signs of inflammation were detected during clinical examination. The patient reported numbness and tingling sensation around her left commissura, which recovered very little over time. Light touch, thermal and mechanical tests were negative around the lower left lip and left commissura, while lingual tissues responded within normal limits. These findings suggested that the affected region was around the inferior alveolar nerve especially around its distal end.

Radiopacity was observed in the mandibular canal, between the apices of lower left second premolar and the mesial root of lower left second molar taken right after the treatment upon the symptoms. A cone-beam computed tomographic (CBCT) imaging (Planmeca ProMax 3D Max; Planmeca, Helsinki, Finland) (Figure 2) was asked as well as new panoramic and periapical radiographs (Figure 1b and c). No visual changes were observed since the previous radiographs and the roots of the lower left first molar were in direct contact with the mandibular canal.

The results were discussed within a multidisciplinary approach with the department of oral surgery. Surgical intervention in order to clean the mandibular canal was also discussed with the patient. Taking into consideration of both the oral surgeons' approach and the patient's own opinion, it was decided to monitor the patient every 6 month in order to monitor any change; whether it would be improvement or deterioration. However, no changes were expected, since, there had been no alternations since the extrusion had occurred. On May 2015, the patient's 1-year recall revealed that her clinical symptoms were persistent (Figure 1d). On radiographic examination, no change was observed.

Discussion

Any damage to the inferior alveolar nerve due to endodontic treatment is relatively rare. A recent PubMed database search with the keyword combination "endodontic and paresthesia" was revealed 70 articles since 1976. Careful examination showed that the numbers of articles regarding paresthesia were 61 (review and/or case reports). Even though these complications are rare, they are as significant as other complications that clinicians face during root canal treatment especially concerning their possible irreversible consequences.

The aim of presenting this case is to stress the importance of taking necessary precautions during root canal treatment. Therefore, examination of the initial dental radiograph is significant especially for those, which are in close proximity with important anatomical structures such as mandibular canal and maxillary sinus.[11,12] More careful analysis and working length determination may be necessary for mandibular first molars where variations occur more frequently compared to mandibular second and third molars[13] as in this case report.

Mandibular canal is surrounded by dense hyper-mineralized bone. Yet, it can be perforated during root canal preparation.[11] Tilotta-Yasukawa et al.[13] discuss that in the posterior region of mandible, bone is not always very dense because it has a greater amount of trabecular bone, which may facilitate the penetration and spreading of foreign materials to the mandibular canal. In addition, a dense cortical bone is not always present around the mandibular canal.[14,15] Thus, apically extruded debri can directly contact the inferior alveolar nerve and may induce chemical and biological mechanisms. To avoid this, combining the initial radiograph and the apex locator results, during working length determination, preparing a solid apical stop, strict adherence to the working length during obturation as well as chemomechanic preparation are essential preventive measures.[16]

Fig. 1. **(a)** Panaromic radiograph after initial treatment (y. 2013). **(b)** Panaromic radiograph after patient's referral (y. 2014). **(c)** Periapical radiograph after patient's referral (y. 2014). **(d)** Periapical radiograph after 1-year recall (y. 2015).

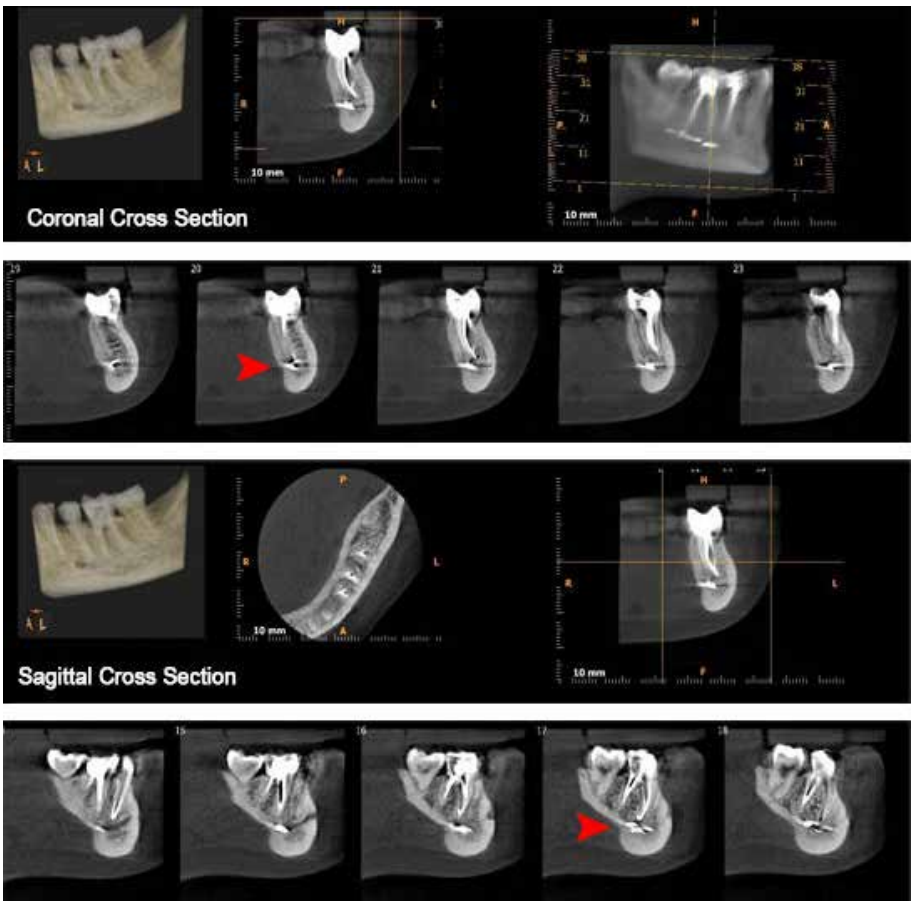

Fig. 2. Coronal and Sagittal cross sectional CBCT images (y. 2014).

Four routes were described regarding the extrusion of filling pastes and cements to the periapical zone: directly toward the mandibular canal, through a periapical vein, through lymphatic vessels, and toward soft tissues between bone and mucosal membrane.[17] In this case, root canal sealer was extruded directly toward the mandibular canal.

Particular ingredients (i.e eugenol) and by products such as paraformaldehyde are known to be more neurotoxic.[3,4] For example, AH26 (De Trey Fréres SA, Zurich, Switzerland) was a commonly used resin based root canal sealer and was known to release formaldehyde as a by-product.[18] The successor; AH Plus (Dentsply DeTrey GmbH, Konstaz, Germany), was found to release less amount of formaldehyde; however, one of its components, bisphenol A, was also reported as causing cytotoxic effects.[19] What is more, the materials like gutta-percha, which is considered to be inert, or calcium hydroxide, which is considered to be a physiologically acceptable material, also showed nerve damage both in experimental studies and in clinical cases.[7,20,21] Not only obturation and intracanal medicament materials, but also irrigation solutions like hypochlorite and etyhlenediamine tetraacedic acid were shown to cause chemical toxicity on nerve tissue.[7,12,20–22] However, the type of the filling paste material and its features of present case report were unknown because contact with the previous dentist was unsuccessful.

Therefore it is crucial to confine whole procedure within the root canal; apply materials according to manufacturers instructions and choosing the appropriate techniques for the case not to damage the nerve tissue.

The literature review on treatment of overextension of endodontic obturation materials reveals that removal of the foreign material from the mandibular canal by sagittal osteotomy can be an effective treatment option.[23] However, in this case surgical intervention was not preferred considering the long period of time following injury supposed to increase the risk of irreversible changes on nerve tissue[23] as well as additional trauma and unpredictable prognosis. Follow-up visits were scheduled.

A more recent literature review on treatment of inferior alveolar nerve damage due to endodontic paste penetration into the mandibular canal revealed that the daily administration of 150 mg pregabalin, which is known as

an anticonvulsant drug, with small doses of prednisone was reported to resolve paresthesia completely when prescribed for a period of one month beginning within three weeks following injury.[24,25] This option was discussed but not preferred in the current case as she was referred more than one year after the injury.

Conclusion

Damage to the inferior alveolar nerve is a relatively rare complication in dental practice. However, it may have long-lasting consequences such as paresthesia presented in the current case. This case report discusses the treatment options for nerve injury due to endodontic treatment as well as stressing the necessity of absolute care to avoid apical extrusion especially when root apices are in close proximity to the mandibular canal.

Conflict of interest: None declared.

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