

Inferior Alveolar Nerve Paresthesia After Overfilling of Endodontic Sealer Into the Mandibular Canal

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Abstract

The present study describes a case of endodontic sealer (AH Plus) penetration within and along the mandibular canal from the periapical zone of a lower second molar after endodontic treatment. The clinical manifestations comprised anesthesia of the left side of the lower lip, paresthesia and anesthesia of the gums in the third quadrant, and paresthesia and anesthesia of the left mental nerve, appearing immediately after endodontic treatment. The paresthesia and anesthesia of the lip and gums were seen to decrease, but the mental nerve paresthesia and anesthesia persisted after 3.5 years. This case illustrates the need to expend great care with all endodontic techniques when performing nonsurgical root canal therapy, especially when the root apices are in close proximity to vital anatomic structures such as the inferior alveolar canal. (*J Endod* 2010; ■:1–3)

Key Words

Endodontic complications, paresthesias of the inferior dental nerve

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The elimination of all diseased pulp and dentin, adequate cleaning and shaping of the root canal system, and its 3-dimensional obturation and sealing constitute the basic principles of endodontic treatment. Ideally, the filling material should be limited to the root canal without extending to periapical tissues or other neighboring structures. However, overinstrumentation of the root canal with hand or mechanically driven files can perforate the mandibular canal, allowing the extrusion of sealers, dressing agents, and irrigation solutions and the passage of microorganisms into the canal during endodontic treatment (1).

Totally biocompatible materials are not available. Consequently, their spread beyond the apical foramen can give rise to clinical manifestations in relation to the toxicity of the product, although minor material extrusions are generally well-tolerated by the periradicular tissues (2). Sealers and filling materials differ chemically and include, among others, AH Plus, AH 26, Hydron, Diaket, Iodoform, Calasept, Endoseal, and chloropercha. Some of them can cause serious neurotoxic complications when extruded into the mandibular canal (3–5). Undesirable complications such as anesthesia, paresthesia, hypoesthesia, hyperesthesia, and dysesthesia can follow the extrusion of an endodontic sealer into the mandibular canal (6–12).

The first symptom of the overfilling into the mandibular canal is sudden pain expressed by the patient during obturation of the root canal, which persists after the disappearance of the local anesthetic effects (13). The pain can be accompanied by local inflammatory signs, with the endodontically treated tooth being painful to percussion, painful on palpation of the vestibular alveolar process, or a combination of signs of mechanical lesions and inferior dental nerve inflammation with pain or numbness of the lower lip or otalgia (6). Some patients experience the persistence of the local anesthesia (12, 14).

The present study describes a case in which endodontic sealer AH Plus spread to the mandibular canal, causing paresthesia and anesthesia in the area of innervation of the inferior alveolar nerve.

Case Report

A 32-year-old woman was referred for root canal treatment in the left second molar tooth because of an apical periodontitis subsequent to caries. The initial diagnosis for the tooth was acute apical abscess (15). She neither smoked nor consumed alcohol and had no personal or family disease antecedents of interest. Two years before, her first mandibular left molar had been extracted, and an endosseous root-formed implant had been placed, supporting a metal-ceramic crown. After adequate anesthesia and isolation with rubber dam, an endodontic access cavity was established. Three canal orifices were defined. After apical patency, the root length was estimated by using an apex detector (AFA Apex Finder; Analytic Technology, Orange County, CA) and then confirmed with a periapical radiograph. The root canal treatment was carried out by involving canal shaping with hand files by using the step-back technique and saline irrigation. After cleaning and shaping, the canal was dried and obturated with AH 26 (Dentsply DeTrey GmbH, Konstanz, Germany) and gutta-percha by using the lateral condensation technique. A small quantity of sealer was introduced into the root canal by using a manual instrument, then the main cone was placed and covered with a minimal quantity of sealer, and cold condensation was performed. Moreover, each additional cone was covered with a minimal quantity of sealer. There were no complications during treatment.

Case Report/Clinical Techniques

107 Just after endodontic treatment, the postoperative periapical
108 radiograph revealed the presence of radiopaque canal sealer in the
109[F1] mandibular canal (Fig. 1). Nevertheless, the patient was still under
110 the effect of the anesthetic, and she reported no pain or other discom-
111 fort after the root canal treatment.

112 The day after, no swelling, redness, or other signs of inflammation
113 were observed on intraoral exploration. However, the patient reported
114 numbness on the left side of the lower lip and a tingling sensation in the
115 vestibular gingival and in the lower left premolar and anterior teeth. Ex-
116 traoral examination likewise failed to identify swelling, alterations in
117 skin color, or adenopathies. The anesthetized zone was delimited by
118 tactile exploration, and anesthesia in the region served by the left infer-
119 rior alveolar and mental nerve was observed. The buccal gingival tissues
120 over the left mandibular molar and premolar teeth felt no sensation;
121 there was no sensation to thermal or mechanical stimuli in either the
122 left lower lip or buccal gingivae. The lingual gingival tissues responded
123 within normal limits to stimulation with an explorer. A panoramic radio-
124[F2] graph was taken (Fig. 2), revealing the presence of radiopaque material
125 (AH Plus) in the periapical area of tooth #18 (universal) and spreading
126 distally along the mandibular canal.

127 After discussing treatment options with the patient, it was decided
128 to monitor the progress with periodic follow-up visits. The patient
129 noticed a very rapid improvement during the first months after the inci-
130 dent. Seven months later, she showed significantly less paresthesia, and
131 the anesthesia in the region of the lower left lip was decreased compared
132 with the initial situation. However, there have been no significant
133 improvements during the subsequent 3 years. The skin anesthesia on
134[F3-4/C] the left side of the lower lip persists (Fig. 3), and the radiopaque mater-
135[F4] ial in the periapical area of tooth #37 is still radiographically evident
136 (Fig. 4).



Figure 1. Post-treatment periapical radiograph. Presence of the extruded root canal sealer in the mandibular canal is evident.



Figure 2. Panoramic radiograph taken the day after showing endodontic paste in the periapical zone of tooth #37 and the inferior alveolar canal.

Discussion

Sensory loss or alteration in the territory of the inferior alveolar nerve, the chin region, and lower homolateral half of the lip is a relatively infrequent complication in daily dental practice and is normally the result of an inadequate dental treatment (12). One of the potential iatrogenic causes of this problem is the incorrect treatment of the root canals of a lower molar or premolar (overextension and/or overfilling). The proximity of the mandibular canal to the apices of the premolar and molar teeth requires a careful radiographic diagnosis when endodontic treatment of these teeth is planned. An initial pretreatment radiograph of the mandibular teeth will reveal the proximity of the canal to the apices (2). Preventive measures such as the use of an electronic apex detector, the application of a good apical stop, or moderate condensation will help avoid overfilling or overextending the endodontic material (11).

During endodontic treatment, it is extremely important to address the cleaning and shaping of the apical third accurately, knowing corrected length and width. The use of an electronic apex detector together with a radiograph taken with the files in position will not only ensure the correct working length but also prevent perforation of the canal and possible subsequent damage to the inferior alveolar nerve resulting from the endodontic treatment.

In the case reported here, preventive measures were taken. The root length was estimated by using an apex detector and confirmed with a periapical radiograph. Poor length control does not seem to be the obvious cause of the overextension of sealer in this case. Moreover, only a small quantity of sealer was introduced into the root canal by using a manual instrument. The main cone was placed covered with



Figure 3. Area of mental nerve anesthesia after 3.5 years is outlined on the skin.

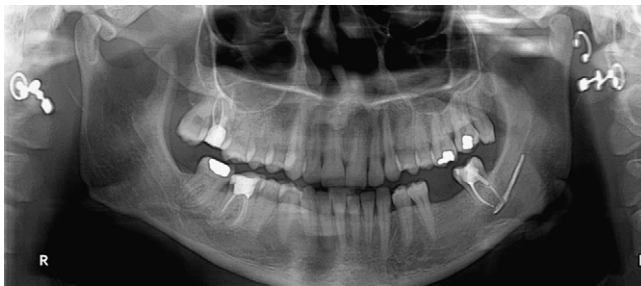


Figure 4. Panoramic radiograph taken 3.5 years after the accident showing the persistence of the endodontic paste in the periapical zone of tooth #37 and the inferior alveolar canal.

a minimal quantity of sealer as well as each additional cone. Likewise, root does not seem to be significantly overfilled. However, the clinician did not use a master gutta-percha cone film before obturation.

Experimental studies have shown that eugenol and paraformaldehyde are the main materials causing neurotoxic reactions (3). The irrigation solutions, such as sodium hypochlorite and ethylenediaminetetraacetic acid (EDTA), might leak into the canal and damage the nerve chemically. Cytotoxic effects of EDTA (16), eugenol (17), and hypochlorite (18) have been described. Escoda-Francoli et al (19) suggested that some of the materials used in certain sealer cements, such as calcium tungstate (scheelite [CaWO₄]) and zirconium oxide (baddeleyite [ZrO₂]), are not totally reabsorbable or innocuous and do not seem to be well-tolerated when overextended beyond the apical foramen.

AH Plus is one of the epoxy resin-based root canal sealers most commonly used. The monomer 2,2-bis[4-(2-hydroxy-3-methacryloxypropoxy)phenyl]-propane (BisGMA), prepared from bisphenol A and glycidyl methacrylate, is the major ingredient of the epoxy resin-based root canal sealers AH 26 and AH Plus (20). AH 26 cures with the generation of formaldehyde as a by-product, but AH Plus only releases small amounts of formaldehyde (21). However, AH Plus can cause cytotoxic effects (22) when extruded into the mandibular canal (4). Moreover, it has been shown that its component bisphenol A can cause cytotoxic effects (23).

Serper et al (24) investigated the neurotoxic effects of the root canal filling materials Endomethasone, N2 Universal, Traitement SPAD, Sealapex, and Calciobiotic Root Canal Sealer on isolated rat sciatic nerves after local application, demonstrating the neurotoxic effects of root canal filling materials. They observed that recovery from chemical insults to nerve structures was relatively slow and was incomplete in the *in vitro* conditions. A larger and more rapid and appreciable recovery was found with sealers without paraformaldehyde and eugenol, which seems to be less toxic to nervous structures when compared with other compounds containing these substances.

In the present case, the buccal gingival tissues over the left mandibular molar and premolar teeth felt no sensation. This could be explained because although the buccal nerve normally supplies these tissues, accessory branches of the inferior alveolar nerve have been described (25, 26).

A literature review of paresthesia and anesthesia cases attributable to the extrusion of a root canal sealer indicated that the surgical removal of the sealer from the mandibular canal is an effective treatment and might restore normal sensation in the affected region (9, 19). However, in the present case, the patient did not want surgical treatment, even though she exhibited complete lip skin anesthesia 3.5

years after the endodontic mishap. This case illustrates the need to expend great care with all endodontic techniques when performing nonsurgical root canal therapy, especially when the root apices are in close proximity to vital anatomic structures such as the inferior alveolar canal.

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