CASE REPORT

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Resolution of paresthesia following non-surgical endodontic treatment of periapical lesions associated with the inferior alveolar and mental nerves: A case series

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Paresthesia is a condition characterized by reduced sensitivity due to sensory nerve damage, often associated with dental procedures and infections. This case series aims to evaluate the recovery of patients experiencing paresthesia following nonsurgical endodontic treatment of periapical lesions closely associated with the inferior alveolar and mental nerves. Three cases of paresthesia were presented, each involving the mandibular region. The patients underwent thorough clinical and radiographic evaluations, including panoramic, periapical radiographs and cone beam computed tomography (CBCT). Nonsurgical endodontic treatments were performed to the related teeth. During treatment procedures, calcium hydroxide was used for intracanal dressing. Root canals were filled with gutta-percha and a root canal sealer. Follow-up visits were conducted at 6-months and 1-year to monitor the resolution of paresthesia and healing of periapical lesions. In all cases, complete recovery from paresthesia was noted during clinical assessments, and radiographic follow-ups at 6 month and 1-year demonstrated significant healing of the periapical lesions. Nonsurgical endodontic treatment is effective in treating paresthesia caused by periapical lesions associated with the inferior alveolar and mental nerves. Early intervention and precise endodontic treatment can lead to complete recovery from paresthesia, as demonstrated in these cases.

Keywords: Endodontics; nerve damage; paresthesia; root canal treatment.

Introduction

Paresthesia is a commonly reported condition characterized by reduced sensitivity in the affected area due to damage to sensory nerves (1). Several factors, both local and systemic, can contribute to the development of paresthesia. Local anesthetics, traumatic injuries (mandibular fractures), local infections (osteomyelitis and periapical infections), expanding and compressive lesions (cysts and benign and malignant neoplasms), tooth extraction, endodontic complications are some of the local factors reported in the literature. Microbiological infections, multiple sclerosis, sarcoidosis, lymphoma, and drug-induced conditions are some systemic conditions resulting in orofacial region paresthesia. The duration of paresthesia can vary widely, ranging from a few days to weeks or even months. Paresthesia has the potential to develop into a permanent condition in certain cases (2-6).

Periapical inflammation resulting from infected root canal

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systems is recognized as a potential cause of paresthesia, both in primary cases and in cases of failed endodontic treatments. Bacterial toxins, such as endotoxins produced by gram-negative bacteria, and their metabolic by-products can induce direct nerve damage, particularly in teeth located in close proximity to the inferior alveolar nerve (IAN) or the mental nerve (MN) (7). Additionally, the inflammatory response triggered by bacterial invasion may lead to mechanical compression and ischemia of the nerve fibers, further contributing to nerve impairment (2,8,9).

IAN is one of the numerous divisions of the mandibular branch of the trigeminal nerve. The MN, a branch of the IAN, exits the mandible via the mental foramen and provides sensation to the anterior portions of the chin and lower lip, as well as the buccal gingivae of the mandibular anterior and premolar teeth (10).

This case series aims to describe the recovery of patients with paresthesia following successful nonsurgical endodontic treatment for periapical lesions in the left second premolar and molar teeth, which are closely associated with the inferior alveolar and mental nerves.

Case 1

A 55-year-old male patient was referred to the Department of Endodontics at Akdeniz University, Faculty of Dentistry, with complaints of paresthesia in the left mandible and lower lip extending to the midline. The patient's medical history revealed no systemic diseases. Clinical examination showed a crown restoration on the mandibular left first molar (tooth #36) and a large amalgam restoration on the second molar (tooth #37). The corner of a piece of paper was moved starting from the left lower lip and across the left mandibular region. However, the patient reported an inability to perceive light touch. These findings indicate the presence of paresthesia in the area innervated by the IAN (2). Panoramic radiographic and periapical evaluations revealed inadequate root canal treatment (RCT) in tooth #36, with large periapical lesions observed on the distal root of tooth #36 and the mesial root of tooth #37 (Fig. 1a, b). Cone beam computed tomography (CBCT) revealed a large periapical lesion involving the mesial root of tooth #37 in relation to the mandibular canal (Fig. 1c).

Under rubber dam isolation, RCT of teeth #36 and #37 was initiated during the first visit. ProTaper Universal Retreatment files D1, D2, and D3 (PTUR: Dentsply Maillefer, Ballaigues, Switzerland) were used for the retreatment of tooth #36. The mesiobuccal and mesiolingual canals of teeth #36 and #37 were prepared up to X3, and the distal canals were prepared up to X4 with the ProTaper Next (PTN: Dentsply Maillefer) rotary file system. Following the use of each file, the root canals were irrigated with 2.5 mL of 2.5% sodium hypochlorite (NaOCl). The solution was activated for 1 minute using the EndoActivator system (Dentsply Tulsa, Tulsa, OK, USA), which was positioned in the root canals 2 mm short of the working length (WL). Final irrigation was performed with 2% chlorhexidine gluconate (CHX) and the canals were dried with paper points. Calcium hydroxide (CH) paste (Calsin, Izmir, Türkiye) was applied as an intracanal dressing for tooth #36. Because of the drainage observed in the distal canal of tooth #37, no intracanal dressing was administered.

In the second visit, the RCT of tooth #36 was completed without any symptoms (Fig. 2a). Since the distal root canal of tooth #37 continued to drain, RCT was continued at 1-week intervals until the drainage ceased. When the drainage was stopped, CH was applied as an intracanal dressing to the root canals during the visit. After two weeks, CH was removed from the root canals of tooth

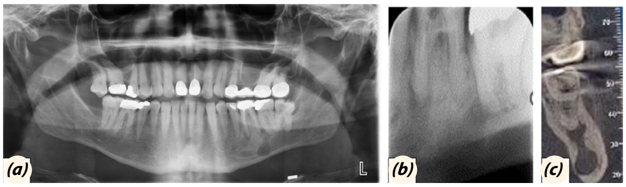

Fig. 1. Panoramic radiographs (a) and periapical (b) showing extensive radiolucent periapical lesions on the mesial root of tooth #36 and additionally involving the distal root of tooth #36 and the mesial root of tooth #37. CBCT image (c) shows the presence of a large periapical lesion involving the mesial root of tooth #37 associated with the mandibular canal.

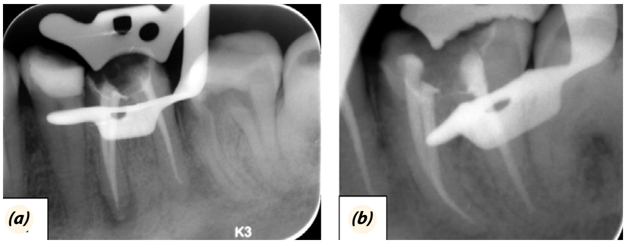

Fig. 2. Completed root canal treatment of teeth #36 (a) and #37 (b).

Fig. 3. 6-month follow-up panoramic radiograph

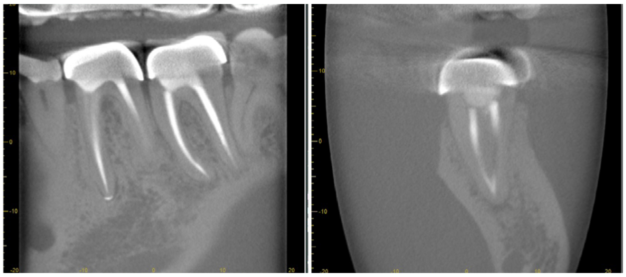

Fig. 4. Periapical lesion associated with the mandibular canal was observed to have completely resolved in the CBCT taken at the 1-year follow-up visit.

Fig. 5. Radiolucent lesions at the root ends of teeth #34 and #35.

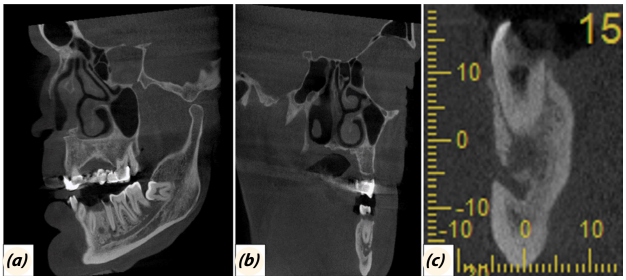

Fig. 6. CBCT revealed that lesion in tooth #35 was directly related to the MN a: Sagittal section b: Coronal section c: Detailed section taken from the mandibular canal region.

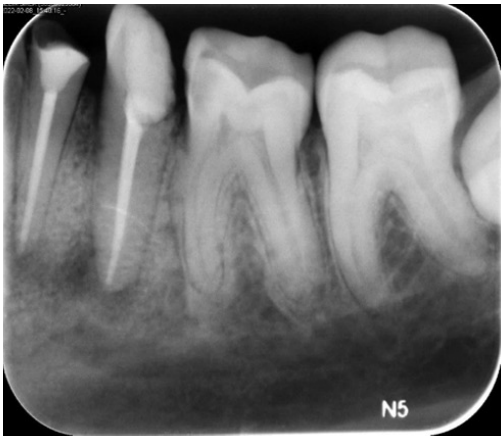

Fig. 7. Periapical radiograph taken after completion of root canal treatment.

#37 using ethylenediaminetetraacetic acid (EDTA) and sonic activation. Cold lateral compaction was used to fill the canals (Fig. 2b).

At the 3-month follow-up, the patient reported that the paresthesia had decreased considerably. On radiographs obtained at the 6-month follow-up, the periapical lesions of teeth #36 and #37 were significantly healed (Fig. 3), and CBCT obtained at the 1-year follow-up revealed that the periapical lesion associated with the mandibular canal had completely healed (Fig. 4). The patient also reported that the paresthesia had completely resolved at the 1-year follow-up.

Case 2

A 37-year-old male patient applied to the Department of Endodontics at Akdeniz University with complaints of paresthesia in the left mandible. At the clinical examination, there was solid swelling extending from tooth #34 to tooth #37. Both teeth were asymptomatic and responded negatively to the electric pulp test. During a sharp/blunt discrimination test using both ends of a dental explorer (2), the patient was unable to distinguish between sharp pricks and blunt pressure across the region extending from the left lip tip through the left floor of the mouth, tongue, and the left side of the neck, indicating a sensory deficit in the affected area. A radiographic examination revealed radiolucent lesions with an irregular border at the apex of teeth #34 and #35 (Fig. 5). A CBCT performed to determine the 3D relationship between the lesion and the mandibular canal revealed that the lesion in tooth #35 was directly related to the MN (Fig. 6).

As a result of all clinical and radiographic examinations, it was decided to perform nonsurgical RCT on teeth #34 and #35. Under rubber dam isolation, the root canals of teeth #34 and #35 were prepared with a Reciproc 40 (R40) file (VDW, Munich, Germany) after the WL was determined. After every three pecking motions, the canals were irrigated with 2.5 mL of 2.5% NaOCl until the WL was reached and the final irrigation was completed with 2% CHX. For irrigation activation, the EndoActivator was inserted into the root canal 2 mm short of the WL and activated for 1 minute. Following the completion of the preparation, CH was placed as an intracanal dressing, and the teeth were temporarily closed. The patient had no pain or swelling 2-week later. CH was removed from the root canals using EDTA and sonic activation, and the canals were filled with R40 gutta-percha and a resin-based canal sealer (Fig. 7).

At the 6-month follow-up, clinical examination revealed complete resolution of the patient's paresthesia, and radiographic assessment showed significant healing of the lesion (Fig. 8).

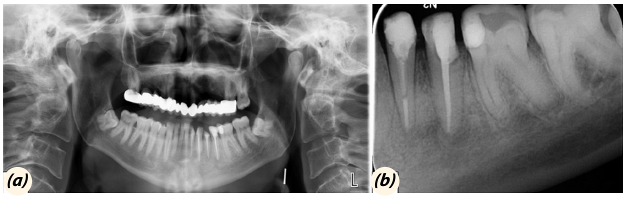

Fig. 8. Panoramic (a) and periapical radiographs (b) taken at the 6-month follow-up appointment revealed that the lesion had significantly healed.

Fig. 9. An apical lesion and inadequate root canal treatment were observed in tooth #37.

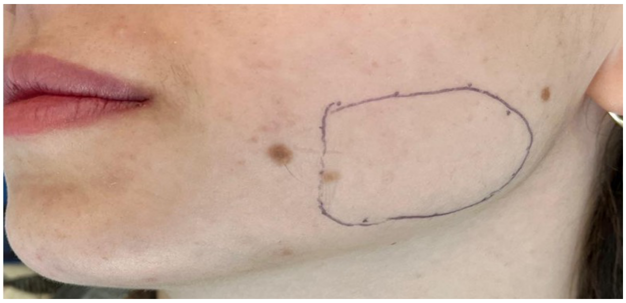

Fig. 10. The patient's paresthesia location.

Case 3

An 18-year-old female patient with numbness in the left mandibular region was admitted to our clinic. An apical lesion and inadequate RCT were observed in tooth #37 as a result of clinical and radiographic assessments of a patient who did not have any systemic disease (Fig. 9). The patient's paresthesia location in the left mandibular cheek region demonstrated no response to sensory testing. The neuropathic area was marked using a ballpoint pen and photographed (Fig. 10) (2). The patient was informed about the diagnosis, treatment options, and possible results.

Under the rubber-dam isolation, the access cavity was opened, and PTUR files D1, D2, and D3 were used to remove gutta-percha. After reaching the apex of each ca-

Fig. 11. Final root canal treatment and indirect restoration.

Fig. 12. The 1-year follow-up panoramic (a) and periapical (b) radiographs.

nal, drainage was observed in the distal canal. After measuring the WL with Apex ID (Sybron Endo, Glendora, Canada), the distal root canal was shaped up to a #70 K file size, while the mesiobuccal and mesiolingual canals were shaped up to a PTN X3 file. Root canals were irrigated with 2.5% NaOCl and activated with EndoActivator between each file for 1 minute. The cavity was temporarily restored with sterile Teflon and glass ionomer cement (Nova Glass F; Imicryl Dental, Türkiye) after final irrigation with 2% CHX. The RCT continued at 1-week intervals until drainage in the distal root canal stopped. CH was used as an intracanal medicament when the drainage stopped during the session two weeks later, CH was removed from the root canals using EDTA and sonic activation, then the distal root canal was filled with 70/.04 gutta percha and lateral compaction, and the mesial canals were filled with single-cone X3 gutta-percha and resin-based Dia ProSeal (DiaDent Group, Cheongju-si, Korea) canal sealer. The tooth was restored with an indirect composite restoration (Fig. 11). During the 1-year follow-up, the tooth was completely free of symptoms, and the apical lesion was completely healed (Fig. 12).

Discussion

Endodontic-related paraesthesia may develop as a result of periapical surgery, an apical periodontitis lesion expanding in close proximity to neural structures, apical extrusion of filling material, or intracanal medications (6,7,11). Infection-induced paresthesia has been observed to subside following successful nonsurgical endodontic therapy.

In this series of cases, paresthesia occurred because of the periapical lesion's proximity to the mandibular canal and MN, and it was decided to apply nonsurgical endodontic treatment using an antimicrobial protocol with CH. In addition, the continuous wave condensation technique may generate higher temperatures; therefore, in these cases, the cold lateral condensation technique was applied and to avoid any overextension into the periapical region, sealer placement and apical tug back of gutta-percha were performed with extreme precision.

The IAN and the MN are the two nerves most affected by endodontics-related paresthesia (7). Due to their close anatomical relationship with the roots of mandibular teeth, these nerves are particularly susceptible to injury caused by periapical lesions, surgical interventions, or the extrusion of filling materials (12,13). The mechanical pressure of the periapical lesion on the IAN and MN, as well as toxic metabolic products of bacteria, have been considered to be the most likely causes of the paresthesia described in these case reports.

The nerve's capacity for healing depends on the degree of damage (both mechanical and chemical), as well as how quickly the cause is eliminated (3). Infection-related paresthesia decreases if the infection and inflammation are eradicated (through antibiotics, RCT, periapical surgery, or tooth extraction). Local anesthetic or over-instrumentation related paresthesia usually disappears in a few days. In situations of nerve fiber laceration, persistent pressure on the nerve, or contact with toxic overfilled endodontic materials, long-term or even permanent paresthesia can occur (5). It has been stated that better treatment results can be obtained if nerve paresthesia is treated as early as possible, and immediate extraction of the tooth is the preferred treatment if there is no sign of healing within three months after the injury to prevent irreversible paresthesia (14).

Similar to the cases presented, literature reports have documented instances where periapical lesions led to paresthesia of the IAN and MN. A report involving two cases of mental nerve paresthesia of endodontic origin demonstrated that endodontic treatment resulted in a rapid regression, with complete resolution of paresthesia within 3 to 12 months (15). Additionally, Genç Şen & Kaplan (16) reported a case where mental nerve paresthesia caused by a periapical infection in the mandibular second premolar resolved within eight weeks following conventional endodontic treatment combined with antibiotic therapy.

In this series of cases, paresthesia diminished or completely disappeared within 3- to 6- month following RCT, and patients were symptom-free at 1-year follow-up. The effective disinfection of the root canal system and thorough chemomechanical instrumentation create an environment conducive to nerve healing by eliminating bacterial infections and their by-products, while also playing a significant role in the healing of periapical lesions and achieving favorable clinical outcomes (9).

In the two cases where drainage was observed, it can be inferred that periapical inflammation caused by an infected root canal system led to nerve compression and injury due to hyperemia and inflammatory edema, resulting in temporary nerve dysfunction. Additionally, bacteria, endotoxins, and bacterial metabolic by-products may have exerted neurotoxic effects, contributing to the clinical presentation (2-7). Exudate release through drainage likely reduced the pressure on surrounding anatomical structures, alleviating symptoms such as pain and paresthesia, while facilitating the healing process.

CBCT significantly enhances diagnostic precision, procedural safety, and postoperative monitoring in cases of IAN and MN paresthesia. By providing a clear and detailed view of the anatomical relationships, CBCT helps prevent nerve injuries, identify their causes, and guide effective management strategies (17,18). In the current case report, CBCT has proven to be a highly effective tool for both accurate diagnosis and comprehensive postoperative monitoring.

Conclusion

This case series demonstrates that nonsurgical endodontic treatment can effectively resolve paresthesia caused by periapical lesions associated with the IAN and MN. Early diagnosis and prompt treatment are crucial in preventing long-term or permanent nerve damage. These findings suggest that with timely and accurate intervention, patients experiencing paresthesia due to dental infections can achieve full recovery.

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