
Inferior alveolar nerve paresthesia of endodontic origin: diagnosis and follow-up using Cone-beam computed tomography

Parestesia do nervo alveolar inferior de origem endodôntica: diagnóstico e acompanhamento por tomografia computadorizada de feixe cônico

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ABSTRACT

Oral paresthesias are usually associated with pathological conditions and surgical procedures on teeth adjacent to the mandibular canal. The most affected nerve is the inferior alveolar nerve. This clinical case reported a paresthesia of endodontic origin with remission after endodontic treatment. Initially, a patient reported severe pain in tooth 45. After 2 days, sensory disturbances were observed, characterized by numbness in the lower lip and right hemimandible. Thirty days after treatment, the patient reported sudden regression of this condition, days before the evaluation. After 10 and 15 months, follow-up CBCT scans were performed and revealed areas of bone neofomation in the region of the periapical lesion, suggestive of repair of the inflammatory process. During these follow-ups, the patient reported no sensory changes or pain symptoms. The use of computed tomography was a relevant strategy in this case because it provides three-dimensional images that allow detailed evaluation of the region.

Keywords: Paresthesia 1; Mandibular canal 2; Focal infection 3;

RESUMO

As parestesias orais geralmente estão associadas a condições patológicas e procedimentos cirúrgicos em dentes adjacentes ao canal mandibular. O nervo mais afetado é o nervo alveolar inferior. Este caso clínico relatou uma parestesia de origem endodôntica com remissão após tratamento endodôntico. Inicialmente, um paciente relatou dor intensa no dente 45. Após 2 dias, foram observados distúrbios sensoriais, caracterizados por dormência no lábio inferior e na hemimandíbula direita. Trinta dias após o tratamento, o paciente relatou regressão súbita do quadro, dias antes da avaliação. Após 10 e 15 meses, foram realizadas TCFC de acompanhamento que revelaram áreas de neoformação óssea na região da lesão periapical, sugestivas de reparação do processo inflamatório. Durante esses acompanhamentos, o paciente não relatou alterações sensoriais ou sintomas de dor. O uso da tomografia computadorizada foi uma estratégia relevante neste caso, pois fornece imagens tridimensionais que permitem avaliação detalhada da região.

Palavras-chave: Parestesia 1; Canal mandibular 2; Infecção local 3;

INTRODUCTION

The inferior alveolar nerve is a branch of the fifth pair of cranial nerves and is classified as a mixed nerve due to motor and sensory functions. Based on the anatomical proximity to the root tooth region of the lower molars, there are reports of sensory changes resulting from dental procedures in this region, such as third molar extraction, anesthetic technique, orthognathic surgery, implant placement and endodontic treatment. (Renton, 2010)

Among the sensory alterations, paresthesia is defined by the loss of sensitivity or sensation of numbness and are described as altered sensitivity to heat or cold, burning, tingling, or stabbing in the affected region. Several cases of paresthesia in the oral region are associated with pathological conditions and dental procedures, and the most affected nerves are the inferior alveolar nerve and the mental nerve. Paresthesias can trigger traumatic injuries resulting from biting, phonation problems, and thermal injuries due to altered temperature perception. (Ferreira et al. 2018)

The etiology of paresthesias includes mechanical, chemical, and microbiological factors. Mechanical lesions occur as a result of compression, stretching, or partial or total rupture of the nerve fibers. Chemical damage can be exemplified by the application of substances in regions close to the nerve, such as leakage of irrigating solutions, endodontic materials, and anesthetic solutions into the mandibular canal. In addition, there are reports of paresthesia during and after endodontic treatment of premolars and molars with periapical infections. There is an increased chance of inferior alveolar nerve paresthesia occurring when tooth roots are in proximity to the mandibular canal. In this context, the presence of a periapical infectious process results in the release of toxic metabolites in sites near the inferior alveolar nerve. In addition, the accumulation of purulent exudate also contributes to the formation of edema that can put pressure on nerve fibers, resulting in paresthesia. (Giuliani et al. 2001)

The numbness and tingling sensation resulting from paresthesia can last for days, weeks, or months, and in cases of total rupture, laceration, or long-term nerve pressure, the damage can be irreversible (Pelka, Petschelt 2008). Imaging exams have been widely used to avoid such complications as they allow a detailed evaluation of the topographic relationship between roots and mandibular canal.

Panoramic radiography is widely used for visualization of anatomical structures, but image overlapping is a relevant limitation of this technique. In this context, computed tomography is a widely indicated modality because it offers images without distortions and superimpositions, associated with the possibility of highly reliable measurements (Ahonem, Tjaderhane 2011). The objective of this study is to report a clinical case of inferior alveolar nerve paresthesia of endodontic origin, addressing the applicability of cone beam computed tomography as a modality of complementary imaging exam for diagnosis, treatment and preservation.

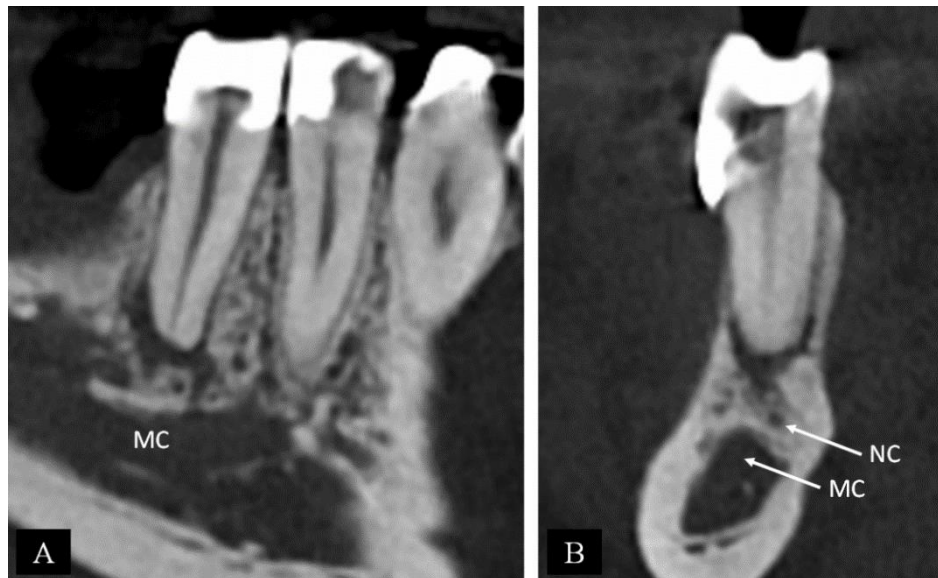
CASE REPORT

A 52-year-old female patient was referred to the dental service of the State University of Ponta Grossa, in August 2021, with a main complaint based on intense pain in the right mandibular second premolar associated with numbness in the lower lip and right hemimandible. The sensory disturbances were observed seven days prior to initial attendance. Two days after the numbness symptomatology, there was intense pain in element 45, with no remission of symptoms with the use of analgesics or anti-inflammatory drugs. During anamnesis and physical examination, no sensitivity to palpation and percussion was detected. Moreover, the tooth showed a negative response to the pulp sensitivity test. Clinically, an extensive composite resin restoration was observed on the occlusal surface of tooth 45.

The initial cone beam computed tomography (CBCT) was realized with the following acquisition parameters: FOV: 5X5, kVp:63.0, mA:08.0 (Eagle 3D, Dabi Atlante, São Paulo, Brazil) and revealed the presence of bone rarefaction with irregular borders in the periapical

region, suggestive of inflammatory/infectious periapical lesion (Figure 1A). The proximity of this rarefaction to the mandibular canal was detected, accompanied by the presence of an adjacent nutrient canal (Figure 1B).

Figure 1A e 1B - Figure I. Initial tomographic aspect. Observe a bony rarefaction with irregular borders in the periapical region, near the mandibular canal (MC) and adjacent nutrient canal (NC). (A: Sagittal adjusted; B: Parasagittal)



Source: the authors (2022).

Based on clinical and complementary exams, the treatment plan included endodontic treatment on tooth 45, performed in two sessions using Ultracal XS® (Ultradent Products, Inc., Indaiatuba, SP, Brazil) and calcium hydroxide-based paste as an intracanal medication. Postoperative pain was controlled with Ibuprofen arginine, 770mg every 8 hours (Spidufen®; Zambon Laboratórios Farmacêuticos Ltda, São Paulo, SP, Brazil) and Carisoprodol + diclofenac sodium + paracetamol + caffeine, every 8 hours (Torsilax®; Brainfarma Indústria Química e Farmacêutica S.A, Anápolis, GO, Brazil).

Thirty days after the endodontic treatment was completed, the patient was reevaluated and reported sudden regression of numbness sensation in the lower lip and right hemimandible days before the reevaluation. In addition, she reported no painful symptomatology on tooth 45.

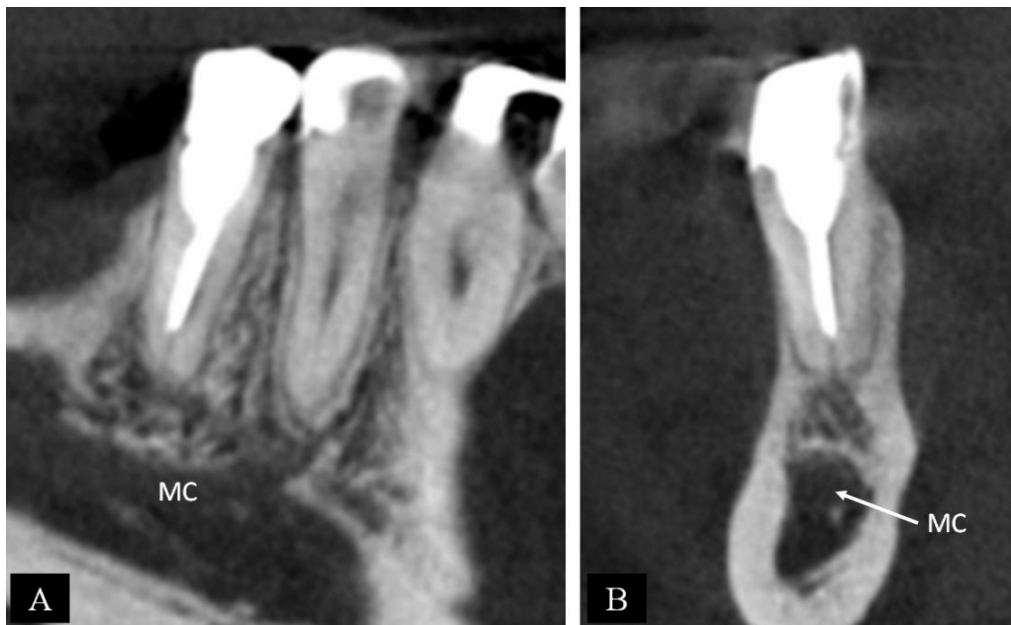
After 10 and 15 months, follow-up CT scans were performed using cone beam computed tomography, which revealed areas of bone neofomation in the region of the periapical lesion (Figures II and III), suggestive of repair of the infectious/inflammatory process. During these follow-ups, the patient reported no sensory changes or pain symptoms.

Figure 2 - CT follow-up after 10 months. MC: mandibular canal. NC: nutrient canal.
(A: Sagittal adjusted; B: Parasagittal).



Source: the authors (2022).

Figure 3 - CT follow-up after 10 months. MC: mandibular canal. (A: Sagittal adjusted; B: Parasagittal).



Source: the authors (2022).

DISCUSSION

Among the paresthesias in a dental context, most occur in the inferior alveolar nerve, followed by the mental nerve (Gowgiel 1992). According to these data, this clinical case reports

the occurrence of paresthesia of the inferior alveolar nerve. The involvement of this region is possibly due to the anatomical profile of the region, since the mandibular canal is a non-continuous, relatively calibrous, cribiform tubular structure (Garcia-Blanco 2021).

The most common etiological factors of paresthesias are associated with surgical procedures such as exodontia of lower posterior teeth. Infections of endodontic origin are reported as etiologic factors, but the frequency of this occurrence is low (Kumar et al 2020). In this case report, the paresthesia was caused by a periapical lesion resulting from an endodontic infection. Possibly, this paresthesia was due to compression by the edema generated in the inflammatory response to the infection in the periapice. Moreover, the presence of toxic metabolites from bacterial metabolism may also be associated with the development of paresthesia, as described by other authors in which remission of the lesion was related to the return of nerve sensitivity (Patel et al 2021). In fact, there are reports of the association of sensory disturbances as numbness in regions with teeth affected by larger periradicular lesions (Gowgiel 1992).

Although the periapical lesion reported in this case did not present large dimensions, with no signs of clinical edema, purulent exudate or presence of fistula, the proximity between the mandibular canal and the apex of the teeth in this region should be considered. Generally, this distance varies between 1 and 4 mm in the region of the mandibular first molars and can be reduced in the premolar region due to the curvature of the innervation towards the mental foramen. Furthermore, the lymphatic vessel system and the inferior alveolar artery may be involved in the dissemination to the nerve endings (Aps, 2013).

In this case report, CT images revealed that the distance between the hypodense end of the periapical lesion and the cortical of the mandibular canal was 2 mm. The small distance, accompanied by the presence of the nutrient canal adjacent to the lesion, are factors that possibly contributed to the occurrence of paresthesia, even in small lesions.

In fact, the presence of nutrient canals seems to be associated with postoperative complications and neurosensory disturbances. This condition differentiates this case report from other cases where the periapical lesion was related only to the main branch of the inferior alveolar nerve (Beukelaer et al. 1998).

The diagnosis of paresthesia is based on the patient's past history and clinical evaluation. Regarding to symptomatology, the presence of lip numbness, gum tingling, ipsilateral facial and infraorbital numbness, pain sensation, edema and numbness of the chin are widely reported. These conditions can be associated with the absence of febrile conditions and alteration in vital signs, adequate mouth opening and presence of pulp necrosis, as observed in this case report (Aps 2013; Patel et al 2021).

In addition, confirmation of the paresthesia condition can be performed using the exploratory probe or light pressure with a pin. These sensitivity tests are described by Beukelaer et al. (1998) as mechanoreceptor stimuli supported by static light touch and directional stroking

to detect degree and extent of paresthesia. Another diagnostic method used in this clinical case and by other authors consists of the patient's report of numbness for prolonged time, reaching 86.6% of the main complaints and only 13.4% of the cases is performed the clinical examination (Pogrel 2007). In this context, paresthesias can interfere with speech, swallowing, and chewing, as well as cause other symptoms such as pain, burning, and numbness in the affected region and adjacent structures (Ziccardi, Assael 2001).

CONCLUSION

Cone beam computed tomography is a viable and accurate alternative for injury assessment and monitoring as it provides three-dimensional images as well as accurate measurement tools. Furthermore, studies have demonstrated that CBCT evaluation minimizes the possibility of injury to the inferior alveolar nerve during surgical procedures compared to patients evaluated with panoramic radiographs alone (Clé-Ovejero et al 2017). However, other authors have observed no differences in the risk of injury to this nerve in patients evaluated with CBCT and panoramic radiographs. (Censi et al 2016)

In this case report, standard endodontic treatment was sufficient for remission of the paresthesia symptoms as well as the periapical lesion. This complete remission has been previously reported, emphasizing the relevance of endodontic treatment for periradicular tissue repair. Possibly, endodontic treatment also resulted in decompression of the inferior alveolar nerve and, consequently, remission of paresthesia. (Censi et al 2016)

This clinical case reported a paresthesia of endodontic origin with remission after endodontic treatment. The use of computed tomography was a relevant strategy in the follow-up of this case because it provides three-dimensional images that allow detailed evaluation of the region. However, further studies should be conducted to elucidate the mechanisms involved in this process and establish more effective strategies for diagnosis and treatment of these lesions.

REFERÊNCIAS

Ahonem M, Tjaderhane L. Endodontic-related paresthesia: a case report and literature review. *J Endod* 2011;10:1460-1464.

Aps JKM. Number of accessory or nutrient canals in the human mandible. *Clin Oral Investig* 2013;18:671–676.

Beukelaer JG, Smeele LE, Van Ginkel FC. Is short-term neurosensory testing after removal of mandibular third molars efficacious? *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998;85(4):366-70.

Censi R, Vavassori V, Borgonovo AE, Re D. Infection Related Inferior Alveolar Nerve Paresthesia in the Lower Premolar Teeth. *Case Rep Dent* 2016;2016:2623507.

Clé-Ovejero A, Sánchez-Torres A, Camps-Font O, Gay-Escoda C, Figueiredo R, Valmaseda-Castellón E. Does 3-dimensional imaging of the third molar reduce the risk of experiencing inferior alveolar nerve injury owing to extraction?: A meta-analysis. *J Am Dent Assoc* 2017;148:575-583.

Ferreira I, Rodrigues P, Pina-Vaz I. Inferior alveolar nerve paresthesia caused by periapical infection: A case report. *JDRR* 2018;2:1-3.

Garcia-Blanco M, Gualtieri AF, Lovaglio-Rivas AC, Ruffini JM, Puia SA. Trigeminal nerve injuries. Four years' experience at a single Argentine referral center and a literature review. *Acta Odontol Latinoam* 2021;34:263-270.

Giuliani M, Lajolo C, Deli G, Silveri C. Inferior alveolar nerve paresthesia caused by endodontic pathosis: a case report and review of the literature. *Oral Surg Oral Med Oral Pathol* 2001;92:670–4.

Gowgiel JM. The position and course of the mandibular canal. *J Oral Implant* 1992;18:383–5.

Kumar U, Kaur CK, Vashisht R, Rattan V. Paresthesia diagnosed using cone-beam computed tomography: a case report. *J Dent Anesth Pain Med* 2020;20(2):95-99.

Patel N, Langaliya A, Kanodia S, Kumbhar A, Buch A, Shah A, et al. Mental nerve paraesthesia: a report of two cases associated with endodontic etiology. *Case Rep Dent* 2021;1747519.

Pelka M, Petschelt A. Permanent mimic musculature and nerve damage caused by sodium hypochlorite: a case report. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2008;106: 80-83.

Pogrel AM. Damage to the inferior alveolar nerve as the result of root canal therapy. *J Am Assoc* 2007;138:65-69.

Renton T. Prevention of iatrogenic inferior alveolar nerve injuries in relation to dental procedures. *Dent Update* 2010;37: 350-352, 354-356, 358-360.

Ziccardi VB, Assael LA. Mechanisms of trigeminal nerve injuries. *Oral Maxillofac Surg Clin North Am* 2001;9:1–11.