PARESTHESIA OF INFERIOR ALVEOLAR AND MENTAL NERVES DUE TO ENDODONTIC TREATMENT: A CASE REPORT

PARESTESIA DE NERVO ALVEOLAR INFERIOR E MENTONIANO DECORRENTE DE TRATAMENTO ENDODÔNTICO: RELATO DE CASO

MARIA GABRIELA CARDOSO BENTO **LIMA**[1], NAYANE CHAGAS CARVALHO **ALVES**[2*], ADEILDES SANTOS DE SOUZA **REZENDE**[1], MARINA MATOS DE **OLIVEIRA**[1], LILIAN TRINDADE GOIS **AGUIAR**[3], MAÍRA PEREIRA DE FARIAS **COSTA**[2]

1. Dentistry student, Gois Aguiar Institute, Aracaju, Sergipe, Brazil; **2.** PhD and MSc in Dental Clinics, Professor in the Post-Graduation Program in Endodontics of the Gois Aguiar Institute - Aracaju, Sergipe, Brazil; **3.** MSc in Dentistry, Coordinator and Professor in the Post-Graduation Program in Endodontics of the Gois Aguiar Institute - Aracaju, Sergipe, Brazil.

* Av. Prof. José Freitas de Andrade, number 3093, Coroa do Meio, Aracaju, Sergipe, Brazil. ZIP Code: 49035-680. nayanecc@gmail.com

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ABSTRACT

The present study reports a clinical case of paresthesia resulting from endodontic treatment in lower premolar. It also emphasizes the importance of cone-beam computed tomography as a visualization aid of anatomical structures relevant to the success of this therapy. The patient complained of pain in the posterior region of the right mandible and was diagnosed with symptomatic irreversible pulpitis in tooth 45. Endodontic therapy was performed in a single session. Seven days later, the patient returned to the clinic and was diagnosed with paresthesia, as the requested tomography revealed slight extrusion of endodontic sealers beyond the apical forame. Laser therapy was initiated, applying 3J per point for 30 seconds, in combination with B-complex vitamins. Complete remission of symptoms was achieved by the 11th laser session. In this study, tomography was critical for diagnosing paresthesia and recommending the necessary treatment. Laser therapy and the prescribed medications were an excellent approach.

KEYWORDS: Mandibular canal, laser therapy, paresthesia, cone-beam computed tomography, B-complex vitamins.

RESUMO

O presente estudo relata um caso clínico de parestesia decorrente de tratamento endodôntico em pré-molar inferior. Ressalta-se, também, a importância da tomografia computadorizada de feixe cônico como recurso auxiliar na visualização de estruturas anatômicas relevantes para o sucesso dessa terapia. O paciente apresentou queixa de dor na região posterior da mandíbula direita e foi diagnosticado com pulpite irreversível sintomática no dente 45. O tratamento endodôntico foi realizado em sessão única. Após sete dias, o paciente retornou ao consultório e foi diagnosticado com parestesia. A tomografia solicitada evidenciou discreto extravasamento de cimento endodôntico além do forame apical. Iniciou-se a laserterapia, com aplicação de 3J por ponto durante 30 segundos e vitaminas do complexo B. A remissão completa dos sintomas foi alcançada na 11ª sessão de laser. Neste estudo, a tomografia foi fundamental para o diagnóstico da parestesia e indicação do tratamento necessário. A laserterapia e as medicações prescritas foram uma excelente abordagem.

PALAVRAS-CHAVE: Canal mandibular, laserterapia, parestesia, tomografia computadorizada de feixe cônico, vitamina do complexo B.

1. INTRODUCTION

During endodontic treatment, chemical irrigants, infected debris, endodontic files, intracanal medications and endodontic sealers may be extruded from the root canal system into the apical region, occasionally causing neurological complications[1,2,3,4].

Surgical and endodontic procedures on lower premolars and molars must account for the possible proximity of teeth´s apices to the inferior alveolar and mental nerves, in order to prevent neurological injury in this region. This anatomical relationship is not uncommon and often underestimated[5,6]. Damage to these nerves during treatment may cause temporary or permanent paresthesia, depending on the severity of the neural impairment[7]. This neurosensory disorder manifests as a burning, tingling, or numbness sensation in the region as a result of neural injury[2].

Currently, Cone-beam computed tomography (CBCT) is considered the gold standard for assessing the proximity of lower premolars and molars apices to the inferior alveolar nerve (IAN) and mental nerve[8]. CBCT provides a three-dimensional and undistorted view of the region, enabling safer and more precise interventions[6,9].

The present study reports a clinical case of paresthesia resulting from endodontic treatment in lower premolar. It also emphasizes the significance of CBCT as a visualization aid of anatomical structures relevant to the success and safety of this therapy.

2. CASE REPORT

The reported clinical case has been submitted to the

Herrero College Local Ethics Committee and approved by Opinion No. 7.389.616 and written according to Preferred Reporting Items for Case reports in Endodontics (PRICE) 2020 guidelines[10]. The PRICE 2020 flowchart presents the complete case report summary (Figure 1).

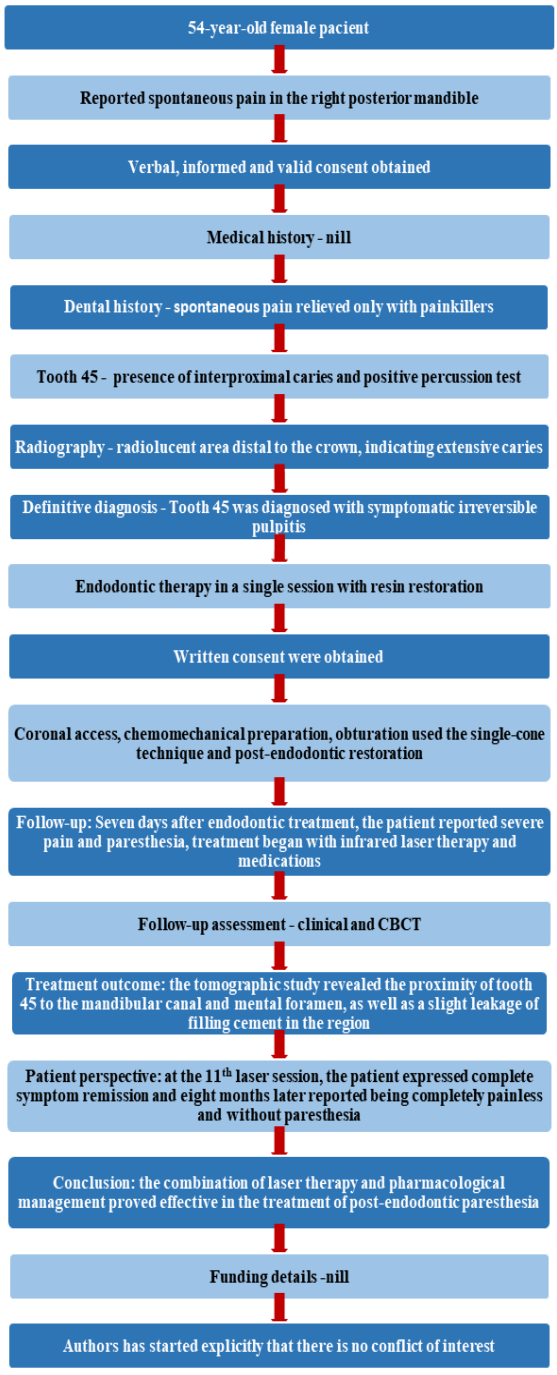

Figure 1. PRICE (2020)[10] flowchart.

A 54-year-old woman reported spontaneous pain in the posterior region of the right mandible, relieved only by analgesics. On clinical examination, tooth 45 presents with interproximal caries and positive percussion test. Radiographic examination revealed a radiolucent area in distal region of the crown, indicating extensive caries (Figure 2). Tooth 45 was diagnosed with symptomatic irreversible pulpitis.

During clinical management, anesthesia was administered via inferior alveolar nerve block and buccal infiltration using 2% lidocaine with 1:100,000 epinephrine. Next, the decayed tissue was removed with an FG 1014 diamond bur, followed by the elevation of distal margin using Filtek™ Z350 resin (Figure 3A–C).

Figure 2. Initial radiograph of tooth 45 (Intraoral sensor for digital radiography. HDR-100/200. Handy Technologies, China). Source: image by the author, 2025.

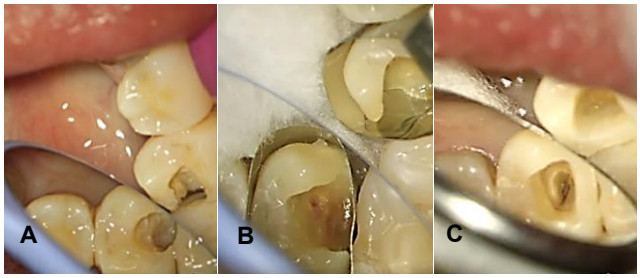

Figure 3. Intra-treatment: **A -** Decayed tissue; **B -** Caries removal; **C** - Distal margin elevation. DFL documentation system (Rio de Janeiro, Brazil). Source: images by the author, 2025.

Coronal access was performed with the same bur and E2D ultrasonic insert (Helse®, São Paulo, Brazil). Subsequently, Chemomechanical preparation (CMP) was carried out. The canal was initially explored with a #10 C-Pilot file (VDW, Germany), and the working length (24.5 mm) was determined using an apex locator. CMP was done with Logic rotary files up to sizes #30.05 and #45.01 (Easy Equipamentos, Belo Horizonte, Brazil), under 2.5% sodium hypochlorite irrigation. After CMP, passive ultrasonic irrigation (PUI) was conducted using the Irrisonic insert (Helse®, São Paulo, Brazil) with 2.5% sodium hypochlorite and 17% EDTA, in three 20-second activation cycles per solution.

The gutta-percha cones were locked 1 mm short of the established working length and confirmed radiographically. Final irrigation was performed with 5 mL of 0.9% sterile saline, followed by drying of the canal with absorbent paper points. Obturation used the single-cone technique with AH Plus Jet sealer (Dentsply®, Germany) (Figure 4A).

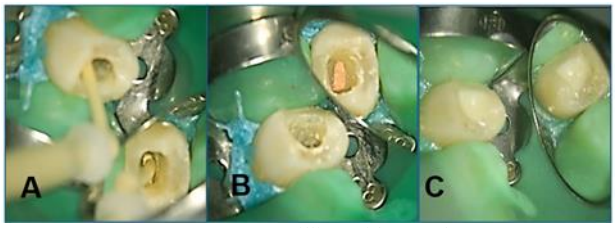

Figure 4. Intra-treatment: **A -** Filling with AH Plus Jet cement; **B -** Pulp chamber cleaning; **C -** Restoration. DFL documentation system (Rio de Janeiro, Brazil). Source: images by the author, 2025.

The cavity was cleaned with 70% ethanol (Figure 4B) and restored with Filtek™ Z350 resin (Figure 4C). A final radiograph was taken (Figure 5).

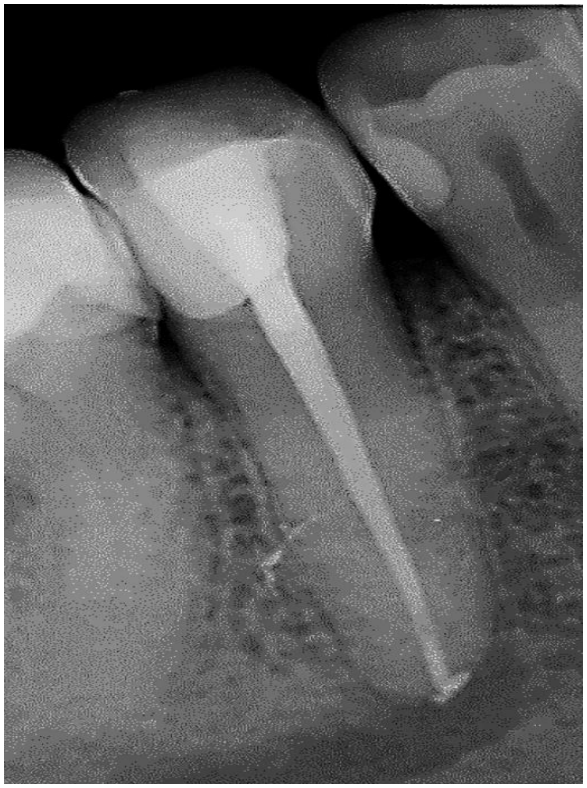

Figure 5. - Final radiograph of tooth 45. (Intraoral sensor for digital radiography. HDR-100/200. Handy Technologies, China). Source: image by the author, 2025.

Seven days after endodontic treatment, the patient reported severe pain and paresthesia, which had begun three days post-procedure. She had self-medicated with 500 mg amoxicillin every 8 hours for two days. The antibiotic was maintained, and Decadron 4 mg was prescribed twice daily for three days, as well as complementary laser therapy. CBCT was requested, revealing proximity between the apex of tooth 45, the mandibular canal, and mental foramen, with slight sealer extrusion (Figure 6).

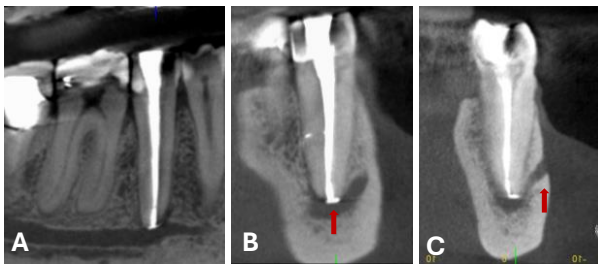

Figure 6. Post-treatment: **A -** CBCT in the sagittal section shows the proximity of the inferior alveolar nerve to the apical third of tooth 45; **B -** CBCT in the coronal section shows slight cement leakage; **C -** CBCT in the coronal section shows the mental foramen. (J. Morita Cone Beam Tomograph, Veraview X800). Source: images by the author, 2025.

Treatment began with infrared laser therapy (808 nm) using a DMC Whitening Laser II device (DMC, São Paulo). Applications were daily for four days, twice a week for two weeks, then weekly until 11 sessions completed. The laser was applied for 30 seconds per point, from the tooth apex along the IAN and mental nerve path, at 3 J/point, with the tip at a 90° angle to the mucosa.

Concomitant with the third laser session, the patient received a prescription for three ampoules of 5000 mcg cyanocobalamin (Citoneurim 5000®), one every seven days. Finally, at the 11th laser session, the patient expressed complete symptom remission. The patient returned to the clinic eight months later for a review and reported being completely painless and without paresthesia.

3. DISCUSSION

During endodontic filling, the sealer may leak into the apical regions, which would not be a problem[11]. However, when there is proximity of the root apices to the IAN and the mental nerve, there is a risk of complications, such as paresthesia[12]. In the region between the molar and premolar, the IAN ascends to form the mental branch which exits through the mental foramen, making this area vulnerable to iatrogenic injury[13].

Bürklein et al. (2015)[5], in a CBCT study involving 821 mandibular second premolars, reported a direct anatomical relationship between the root apex and the mandibular canal in 3.2% of the cases. Similarly, in the present clinical case, such proximity was observed, along with a slight extrusion of AH Plus JET sealer. The intimate anatomical relationship between the root apex, the IAN, and the mental nerve likely contributed to an unintended neurological injury, resulting in paresthesia. The incidence of this occurrence in premolars is low, but Knowles *et al.* (2003)[13] mention that “when it occurs in a single patient, it means 100%.”

AH Plus Jet cement provides satisfactory sealing, dimensional stability, radiopacity, and flow, according to the manufacturer[11]. An excessive flow rate of the filling cement may lead to the extrusion of this material through the apical foramen. Some endodontic treatment steps may also contribute to this outcome, including thermoplastic filling techniques[14], foraminal

enlargement[7], over-instrumentation, and failure to perform correct odontometry throughout the preparation[15]. Occasionally, during CMP, inadvertent overextension of the endodontic instrument beyond the apical foramen may result in disruption of the epineurium, a connective tissue layer that encases the nerve, thereby creating a direct pathway for endodontic filling materials to reach the nerve bundles, potentially leading to paresthesia[16]. Therefore, foraminal enlargement should be minimized in these cases to prevent accidents[7]. In the present clinical case, apical preparation was completed using an instrument with a 0.45 mm tip diameter. This enlargement may have contributed to a slight extrusion of the root canal sealer. Given the direct proximity of the root apex to adjacent neural structures, the intimate contact between the sealer and the nerve fibers may have resulted in the observed paresthesia. Additional clinical cases reported in the literature have also demonstrated paresthesia following endodontic sealer extrusion in this region[3,12,17,18].

Current literature strongly supports the use of CBCT in cases involving anatomical complexity[15,19,20]. Bornstein et al. (2011)[21], using CBCT, observed high accuracy in measuring the distance between mandibular apices and IAN, unlike periapical radiography, which succeeded in only 35.3% of cases. Von Arx *et al.* (2013)[19] emphasized the importance of a three-dimensional examination in treatments near these structures, avoiding injuries to the neurovascular bundle. Patel *et al.* (2019)[20] also recommended its use in regions close to the anatomical structures relevant to the treatment, which cannot be accurately verified in conventional periapical radiographs.

In the present case, the initial periapical radiograph revealed a radiolucent area in the apical region of the mandibular premolar, suggestive of the mandibular canal and mental foramen. A preoperative CBCT scan could have identified the high-risk anatomy and potentially prevented complication. However, CBCT was only requested seven days after endodontic treatment, and its findings proved extremely important for guiding the subsequent clinical management.

Several therapeutic modalities have been indicated for this complication, including laser therapy, antibiotics, corticosteroids, anti-inflammatory drugs, proteolytic enzymes, vitamins and pregabalin[2,12,18,22,23]. In this clinical case, B-complex vitamins, a corticosteroid, an antibiotic, and laser therapy were employed.

It is well established that laser therapy has emerged as an effective treatment for lesions of IAN, demonstrating beneficial biological effects such as analgesic and anti-inflammatory actions, tissue biomodulation, and effective neurosensory recovery. Bozkaya et al. (2020)[22] analyzed the effects of laser therapy in patients with paresthesia following dental procedures and reported favorable outcomes with treatment protocols ranging from 10 to 16 sessions. In this case, the patient achieved complete symptom remission by the 11th laser session.

4. CONCLUSION

High-quality CBCT enhances diagnostic accuracy and supports safer treatment planning by providing precise anatomical information. The prior request for CBCT could prevent unwanted accidents, such as paresthesia. In this case, CBCT was essential for diagnosing paresthesia due to endodontic sealer extrusion. The combination of laser therapy and pharmacological management proved effective, highlighting that successful outcomes result from a comprehensive, multimodal approach.

5. REFERENCES

[1] Hülsmann M, Hahn W. Complications during root canal irrigation--literature review and case reports. Int Endod J. 2000 May; 33(3):186-93.

[2] Mohammadi Z. Endodontics-related paresthesia of the mental and inferior alveolar nerves: An updated review. J Can Dent Assoc 2010; 76: a117.

[3] Coskunses FM, Sinanoglu A, Helvacioglu-Yigit D, Abbott PV. The extrusion of root canal cement containing paraformaldehyde into the inferior alveolar nerve canal resulting in infection and numbness. Int Endod J. 2016 Jun; 49(6):610-617.

[4] Montenegro Fonsêca J, Rangel Palmier N, Amaral-Silva GK, Aristizabal Arboleda LP, Affonso Almeida JF, de Goes MF, Agustin Vargas P, Ajudarte Lopes M, Santos-Silva AR. Massive extrusion of calcium hydroxide paste containing barium sulphate during endodontic treatment. Aust Endod J. 2020 Aug; 46(2):257-262. 2019 Nov 14.

[5] Bürklein S, Grund C, Schäfer E. Relationship between Root Apices and the Mandibular Canal: A Cone-beam Computed Tomographic Analysis in a German Population. J Endod. 2015 Oct; 41(10):1696-700.

[6] Wang X, Chen K, Wang S, Tiwari SK, Ye L, Peng L. Relationship between the Mental Foramen, Mandibular Canal, and the Surgical Access Line of the Mandibular Posterior Teeth: A Cone-beam Computed Tomographic Analysis. J Endod. 2017 Aug; 43(8):1262-1266.

[7] Alves FR, Coutinho MS, Gonçalves LS. Endodontic-related facial paresthesia: systematic review. J Can Dent Assoc. 2014; 80: e13.

[8] Razumova S, Brago A, Howijieh A, Barakat H, Kozlova Y, Razumov N. Evaluation the relationship between mandibular molar root apices and mandibular canal among residents of the Moscow population using cone-beam computed tomography technique. Contemp Clin Dent 2022; 13:3-8

[9] Patel S, Dawood A, Pitt Ford T, Whaites E. The potential applications of cone beam computed tomography in the management of endodontic problems. Int Endod J. 2007; 40(10):818–830.

[10] Nagendrababu V, Chong BS, McCabe P, Shah PK, Priya E, Jayaraman J, Pulikkotil SJ, Setzer FC,

Sunde PT, Dummer PMH. PRICE 2020 guidelines for reporting case reports in Endodontics: a consensus-based development. Int Endod J. 2020 May; 53(5):619-626.

[11] Martins JFB, Scheeren B, van der Waal SV. The Effect of Unintentional AH-Plus Sealer Extrusion on Resolution of Apical Periodontitis After Root Canal Treatment and Retreatment- A Retrospective Case-control Study. J Endod. 2023 Oct; 49(10):1262-1268.

[12] López-López J, Estrugo-Devesa A, Jané-Salas E, Segura-Egea JJ. Inferior alveolar nerve injury resulting from overextension of an endodontic sealer: non-surgical management using the GABA analogue pregabalin. Int Endod J. 2012 Jan; 45(01):98-104.

[13] Knowles KI, Jergenson MA, Howard JH. Paresthesia associated with endodontic treatment of mandibular premolars. J Endod. 2003 Nov; 29(11):768-70.

[14] Robinson MJ, McDonald NJ, Mullally PJ. Apical extrusion of thermoplasticized obturating material in canals instrumented with Profile 0.06 or Profile GT. J Endod. 2004 Jun; 30(6):418-21.

[15] Terauchi Y, Renton T. F. Managing iatrogenic events. In: Cohen's Pathways of The Pulp, Berman, Louis H.; Hargreaves, Kenneth M. Elsevier Health Sciences. 2021; 3210-3440.

[16] Pogrel, M. Anthony. Damage to the inferior alveolar nerve as the result of root canal therapy. The Journal of the American Dental Association. 2007; 138(01):65-69.

[17] González-Martín M, Torres-Lagares D, Gutiérrez-Pérez JL, Segura-Egea JJ. Inferior alveolar nerve paresthesia after overfilling of endodontic sealer into the mandibular canal. J Endod. 2010 Aug; 36(8):1419-21.

[18] Alonso-Ezpeleta O, Martín PJ, López-López J, Castellanos-Cosano L, Martín-González J, Segura-Egea JJ. Pregabalin in the treatment of inferior alveolar nerve paraesthesia following overfilling of endodontic sealer. J Clin Exp Dent. 2014 Apr 1; 6(2): e197-202.

[19] Von Arx T, Friedli M, Sendi P, Lozanoff S, Bornstein MM. Location and dimensions of the mental foramen: a radiographic analysis by using cone-beam computed tomography. J Endod. 2013 Dec; 39(12):1522-8.

[20] Patel S, Brown J, Semper JM, Abella F, Mannocci F. European Society of Endodontology position statement: Use of cone beam computed tomography in Endodontics. Int Endod J. 2019; 52:1675–1678.

[21] Bornstein MM, Lauber R, Sendi P, von Arx T. Comparison of periapical radiography and limited cone-beam computed tomography in mandibular molars for analysis of anatomical landmarks before apical surgery. J Endod. 2011 Feb; 37(2):151-7.

[22] Bozkaya S, Tunc EP, Ogutlu F. Effect of Photobiomodulation Therapy on Inferior Alveolar and Lingual Nerve Injuries After Dental Procedures. Photobiomodulation, Photomedicine, and Laser Surgery, 2020 Sep; 38(9):531-536.

[23] Santos AA, Matheus Cordeiro Crivelli MC, Bravin PK. Treatments for Paresthesia Associated with Orthognathic Surgery: a review. Brazilian Journal of Surgery and Clinical Research 2024; 48(01):43-52.