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Endodontic Intervention for the Control of Periapical Injury Associated with Traumatized Teeth: A Case Report

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ABSTRACT

The incidence of patients affected by dental trauma is quite frequent. The treatment of choice should be selected according to the severity level of dental trauma in odontology. Periapical injuries caused by trauma can lead to a rupture of the pulpal blood supply. The objective of the present paper is to present a clinical case of endodontic therapy on two necrotic teeth with a periapical lesion resulting from dental trauma. A 36-year-old patient, male, melanoderma, normosystemic, attended the Nilton Lins University Dental Clinic reporting anterior region discomfort on chewing. He also complained about his smile due to tooth darkening. Sensibility tests were performed, confirming a state of necrosis in teeth 11 and 12. In the periapical radiographs, the teeth presented a radiolucent, circumscribed image delimited in the root apex region, suggesting periapical injury. Based on clinical and radiographic findings, the proposed treatment was pulpectomy with subsequent endogenous bleaching. The endodontic intervention was performed in two sessions after exposure to intracanal medication and endogenous bleaching in four sessions, using the association of 37% Whiteness carbamide peroxide and 20% Whiteness sodium perborate. The success or failure of endodontic treatment with a periapical lesion is related to the control of the infection associated with the healing response, whether partial or total. The treatment proved effective after one year of follow-up, supported by the clinical characteristics combined with the radiographic findings, promoting the return of the teeth to their aesthetic and functional capacities, meeting the expected expectations. The patient is under follow-up.

1. Introduction

Periapical lesions are also caused by trauma, in which the impact leads to rupture of the pulpal blood supply and fibers of the periodontal ligament.[1] This rupture causes pulpal tissue necrosis, resulting in pulpal putrefaction due to such an interruption: aseptic death with the absence of microorganisms, but which, due to the anchoress, become infectious. Consequently, they facilitate the penetration of microorganisms that proliferate the pulpal tissue.[2] There is an invasion of bacteria within the pulp tissue in a situation of necrosis due to the source of nutrients within the canal.[1-3] The bacterial flora in necrotic teeth has predominantly facultative anaerobic bacteria in the early stages of infections.[4] Endodontic therapy is the first choice to combat infectious diseases within the root canal. Its success in these cases is determined by cleaning and shaping the root canal, choosing the filling material with antimicrobial, bactericidal, and tissue biocompatibility properties, and making an adequate hermetic seal.[4] The biomechanical preparation (BMP) is responsible for the elimination of bacteria through the removal of the infected pulp.[5] This process needs to be copiously followed by irrigation during the canal shaping.[5, 6] Sodium hypochlorite is the intracanal irrigant most used in endodontics since antimicrobial action, lubricating agent, and solvent of organic matter characterize it.[6] Intracanal medication (IM) is used between sessions to promote canal neutralization and act as a source of filling.[4, 6] Calcium hydroxide-based paste associated with camphorated paramonochlorophenol, combined with glycerin as a vehicle, improves the therapeutic effect, accelerating the process of bacterial destruction.[7] When correctly performed, the BMP related to IM makes it more likely to reduce the periapical lesion.[6-8] The control of infection in periapical lesions must be monitored periodically after the conclusion of the treatment.[9] Therefore, the paper aims to present a clinical case of endodontic therapy on two necrotic teeth with a periapical lesion for trauma.

2. Case Presentation

A 36-year-old male patient, melanoderma, normosystemic, reported discomfort during chewing in the anterior region and complained of dissatisfaction with the esthetics of his smile due to tooth darkening. After

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measuring the blood pressure, a picture of normality was presented for continuity of care. A sensitivity test with soda gas was performed, where necrosis was found on teeth 11 and 12. Soon after, percussion tests were performed with a mirror handle: horizontal, in which he did not present symptoms, and vertical, where he complained of pain (Fig. 1).

Fig. 1. Initial clinical appearance with darkening of teeth 11 and 12.

In the periapical radiography, the teeth presented a radiolucent, circumscribed image delimited in the root apex region, suggesting a periapical lesion (Fig. 2). Based on the clinical characteristics combined with the radiographic findings to resolve the clinical case, the treatment proposed to the patient was pulpectomy with subsequent completion of endogenous whitening to regain the esthetics. Therapy began with absolute isolation with a rubber sheet supported by a 210 clamp, complemented on the periphery of the neck region of the teeth with a gingival barrier. Soon after, the provisional restoration was removed, and the access was regularized to view the conduit using 1014 HL and Endo Z spherical drills. With this stage completed, the actual working length of teeth 11 and 12 was confirmed with an apex locator (Root ZX II, J Morita, Suita Osaka, Japan) at 23 mm and 22 mm, respectively.

Fig. 2. Periapical radiography.

Once this measurement was confirmed, instrumentation was performed following the crown-down technique with K-type manual files (Dentsply, New York, EUA), with copious irrigation with sodium hypochlorite at a concentration of 2.5% for each file change. The master apical file (MAF) used in both teeth was #55. Subsequently, the IM was prepared using PA calcium hydroxide, camphorated paramonochlorophenol mixed with glycerin vehicle (HPG), and taken to the conduit with a #2 Lentulo drill. After 14 days, the patient returned, and the teeth were isolated again, following all the initial steps. From the MAF, the apical stop was made, followed by the selection of the cone. After the visual, tactile, and radiographic tests, the main cone 55 was selected in both canals, which guided the obturation. The conduit was prepared with EDTA (ethylenediaminetetraacetic acid) to remove the smear layer, stirring it for 2 minutes with the aid of the MAF. Gutta-percha cones were disinfected with 2.5% sodium hypochlorite. Next, the material was removed by abundant irrigation with the same solution. The conduits were dried with paper points referring to the MAF. After all the preparations, the canals were filled with endodontic cement Sealer 26 (Dentsplay, New York, EUA) through the vertical hydraulic compression technique with a single M cone calibrated to the MAF measurement. The cones were cut and condensed with Paiva pressers. Next, the canals were shielded with provisional obturator cement (Coltene, Altsätten, Switzerland) to promote coronary sealing. Subsequently, the provisional restoration was made with restorative glass ionomer cement (FGM, Joinville, SC, Brazil). In the final radiograph, the sealing of the root canal can be highlighted with adequate sealing and the presence of small extravasation of filling material. The patient is still in follow-up (Fig. 3).

Fig. 3. Final radiography immediate.

The patient returned for a new evaluation after the 6-month follow-up period of the endodontic treatment. In the radiographic examination, an image suggestive of reduction of the periapical lesion stood out (Fig. 4). In the clinical aspect, tooth 11 showed a color change. Endogenous bleaching sessions were planned on the respective endodontically treated teeth for good clinical and esthetic results.

Fig. 4. Radiography after six months.

The endogenous bleaching treatment was chosen with the association of the techniques: external with 37% Whiteness carbamide peroxide (FGM, São Paulo, SP, Brazil); and internal with 20% Whiteness sodium perborate (FGM, São Paulo, SP, Brazil). Temporary material was removed from the cavity. With the aid of a Gattes-Gliden, 1.5 mm of obturation. The material of choice for creating the cervical plug was the glass ionomer, which was inserted with the Centrix syringe, kept in the cavity, and sealed with a small amount of sterile cotton and temporary restorative material. Four sessions of endogenous bleaching were performed with a time interval of 3 days at the end of each session, and two sessions of conventional bleaching with an interval of 15 days. Subsequently, a direct restoration was made with composite resin to fill the cavity (Vittra Aps, FGM, São Paulo, SP, Brazil) (Fig. 5). After the 1-year follow-up period, a suggestive aspect of the bone formation process in the affected area can be highlighted (Fig. 6).

Fig. 5. Final clinical appearance.

Fig. 6. Radiography after one year.

3. Discussion

Early diagnosis of traumatized teeth with damage to the pulp makes it possible to carry out a correct prognosis and effective treatment.[10] However, early endodontic interventions should be avoided until the signs regarding the absence of pulp sensitivity are clear.[11] The diagnostic hypothesis of the clinical case was based on clinical manifestations combined with the radiographic findings, where discoloration was observed at the crown level due to blood leakage into the dentinal tubules, a condition suggestive of possible changes resulting from trauma, confirmed by periapical radiography through the presence of a lesion associated with the root apex of the discolored teeth.[1, 12] When dealing with the instrumentation of the necrotic root canal system (RCS), it is recommended to perform the crown-down technique (crown-apex), which consists of the initial widening of the cervical and middle third and later the apical third, where not only rotary instruments can be used, but also manual ones, or hybridizing the techniques in the association.[13] The crown-apex technique promotes disinfectant penetration, thus preventing the extrusion of infected material to the apical region, preventing an infection.[14] A manual technique was chosen for the present case since it provides adequate modeling and penetration of the irrigating material. Pulpectomy in a single session offers numerous advantages, such as: reducing the number of visits to the dentist, reducing the risk of bacterial recontamination between sessions, and allowing more significant savings for the professional and the patient.[15] However, the permanence of persistent bacteria inside the root canal causes complications such as contamination of the periapical region with subsequent symptoms.[16] Riaz et al.[15] state that it is impossible to perform total disinfection inside the conduit, defending the idea that it is only possible to neutralize the existing bacterial colony in the canal if an IM is used after BMP, corroborating the work. Ibrahim et al.[16] demonstrate that only part of the bacteria in the medium is eliminated during instrumentation, so if RCS infection control occurs, it is necessary to use an IM capable of acting on bacterial inhibition. Medication based on the combination of calcium hydroxide, camphorated paramonochlorophenol, and glycerin acts directly on the bacteria that will remain inside the conduit after the BMP, delaying manifestations that may cause signs of reinfection.[19] The combination was inserted between the two sessions to assist in the disinfection of the canal, avoiding possible new contamination. The obturator material fills the root walls with the gutta-percha cone and bandages, providing stability.[20] Calcium hydroxide-based endodontic cement fills difficult-to-access areas such as dentinal tubules and accessory canals, acting on the burial of microorganisms in the medium and releasing hydroxyl ions responsible for increasing the pH.[21] The cement of choice for the present case was based on calcium hydroxide and had biocompatibility and adequate drainage. According to Komabayashi et al.[19], the main characteristics of this cement are its ability to stimulate the periapical tissues, accelerate the repair process, antimicrobial action, and lower toxicity of the proteins inside the root canal. The success of endodontic therapy in necrotic teeth results from the correct association of BMP, IM, infection control, and filling, resulting in the main objective of endodontic treatment, restoring health, esthetics, and function to the tooth.[18] The healing potential of periapical lesions should be analyzed for 6 to 12 months after the completion of endodontic treatment.[19] However, Çaliskan et al.[20] reported that some cases require up to 4 years for complete healing, claiming that the case should be followed up for long periods to confirm positive responses regarding repair. Even with limitations regarding the level of return of the final color, the chosen procedure is a viable and conservative option in the face of more invasive methods aimed at masking the substrate in the future.[21] Local trauma can have considerable consequences, among which the following stand out: alteration of tissue pigmentation and dental fracture as clinical factors, in addition to forming periapical lesions and bone resorption processes analyzed by radiographic examinations.[22] For this reason, periodic longitudinal follow-up is necessary to observe any adverse manifestation involving the affected tooth, especially in radiographic aspects.[20, 22] From the beginning of the treatment, the patient in this report was aware of the importance of periodic follow-up to rule out adverse conditions such as future resorptions. The bleaching of endodontically treated teeth allows the devolution of aesthetic aspects by a conservative approach through whitening gels, either internally isolated or in association with external bleaching agents.[21] However, this process makes the tooth susceptible to the development of tooth resorption during or after the end of the treatment; this factor can be circumvented by choosing internal

whitening gels with low concentrations.[23, 24] In the present report, the final result promoted by the combined whitening technique obtained the total satisfaction of the patient, managing to restore the aesthetics impaired by local color change, solving the main complaint. In addition, it is notorious for realizing that this topic still needs further studies with longitudinal clinical implications to solidify the ideal conduct further.

4. Conclusion

The success or failure of endodontic treatment with a periapical lesion is directly related to infection control, associated with the lesion's healing response, whether partial or total. The treatment proved effective according to the clinical characteristics combined with the radiographic findings, promoting the return of the teeth to their esthetic and functional capabilities and meeting the predicted expectations.

Conflict of Interest

The authors declared that there is no conflict of interest.

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References

[1] Karamifar K, Tondari A, Saghiri MA. Endodontic periapical lesion: An overview on the etiology, diagnosis and current treatment modalities. European Endodontic Journal. 2020;5(2):54-67. https://doi.org/10.14744/eej.2020.42714.

[2] Paikkatt JV, Aslam S, Sreedharan S, Philomina B, Kannan VP, Madhu S. Efficacy of various intracanal medicaments against aerobic and facultative anaerobic microorganism found in human primary teeth with necrotic pulp: a randomized clinical trial. Journal of Indian Society of Pedodontics and Preventive Dentistry. 2018;36(3):268-72. https://doi.org/10.4103/JISPPD.JISPPD_152_17.

[3] Bergenholtz G. Assessment of treatment failure in endodontic therapy. Journal of oral rehabilitation. 2016;43(10):753-8. https://doi.org/10.1111/joor.12423.

[4] Cassol DV, Duarte ML, Pintor AV, Barcelos R, Primo LG. Iodoform vs calcium hydroxide/zinc oxide based pastes: 12-month findings of a randomized controlled trial. Brazilian Oral Research. 2019;33. https://doi.org/10.1590/1807-3107bor-2019.vol33.0002.

[5] Prada I, Micó-Muñoz P, Giner-Lluesma T, Micó-Martínez P, Muwaquet-Rodríguez S, Albero-Monteagudo A. Update of the therapeutic planning of irrigation and intracanal medication in root canal treatment. A literature review. Journal of clinical and experimental dentistry. 2019;11(2):e185-193. https://doi.org/10.4317/jced.55560.

[6] Swanljung O, Vehkalahti MM. Root canal irrigants and medicaments in endodontic malpractice cases: a nationwide longitudinal observation. Journal of endodontics. 2018;44(4):559-64. https://doi.org/10.1016/j.joen.2018.01.003.

[7] Zancan RF, Vivan RR, Lopes MR, Weckwerth PH, de Andrade FB, Ponce JB, et al. Antimicrobial activity and physicochemical properties of calcium hydroxide pastes used as intracanal medication. Journal of endodontics. 2016;42(12):1822-8. https://doi.org/10.1016/j.joen.2016.08.017.

[8] França GM, Carmo AF, Costa H, Andrade AL, Lima KC, Galvão HC. Macrophages subpopulations in chronic periapical lesions according to clinical and morphological aspects. Brazilian Oral Research. 2019;33. https://doi.org/10.1590/1807-3107bor-2019.vol33.0047.

[9] Caldeira CL, Barletta FB, Ilha MC, Abrão CV, Gavini G. Pulse oximetry: a useful test for evaluating pulp vitality in traumatized teeth. Dental Traumatology. 2016;32(5):385-9. https://doi.org/10.1111/edt.12279.

[10] Moccelini BS, De Alencar NA, Bolan M, Magno MB, Maia LC, Cardoso M. Pulp necrosis and crown discoloration: a systematic review and meta-analysis. International Journal of Paediatric Dentistry. 2018;28(5):432-42. https://doi.org/10.1111/ipd.12372.

[11] Kimura S, Ebihara A, Maki K, Nishijo M, Tokita D, Okiji T. Effect of optimum torque reverse motion on torque and force generation during root canal instrumentation with crown-down and single-length techniques. Journal of Endodontics. 2020;46(2):232-7. https://doi.org/10.1016/j.joen.2019.11.007.

[12] Peralta-Mamani M, Rios D, Duarte MA, Santiago Junior JF, Honorio HM. Manual vs. rotary instrumentation in endodontic treatment of permanent teeth: A systematic review and meta-analysis. American journal of dentistry. 2019;32(6):311-24.

[13] Manchanda S, Sardana D, Yiu CK. A systematic review and meta-analysis of randomized clinical trials comparing rotary canal instrumentation techniques with manual instrumentation techniques in primary teeth. International Endodontic Journal. 2020;53(3):333-53. https://doi.org/10.1111/iej.13233.

[14] Schwendicke F, Göstemeyer G. Single-visit or multiple-visit root canal treatment: systematic review, meta-analysis and trial sequential analysis. BMJ open. 2017;7(2):e013115. http://dx.doi.org/10.1136/bmjopen-2016-013115.

[15] Riaz A, Maxood A, Abdullah S, Saba K, Din SU, Zahid S. Comparison of frequency of post-obturation pain of single versus multiple visit root canal treatment of necrotic teeth with infected root canals. A Randomized Controlled Trial. J Pak Med Assoc. 2018;68(10):1429-33.

[16] Ibrahim AM, Zakhary SY, Amin SA. Calcium hydroxide intracanal medication effects on pain and flare-up: a systematic review and meta-analysis. Restorative Dentistry & Endodontics. 2020;45(3):e26. https://doi.org/10.5395/rde.2020.45.e26.

[17] Donnermeyer D, Bürklein S, Dammaschke T, Schäfer E. Endodontic sealers based on calcium silicates: a systematic review. Odontology. 2019;107(4):421-36. https://doi.org/10.1007/s10266-018-0400-3.

[18] Palanivelu CR, Ravi V, Sivakumar AA, Sivakumar JS, Prasad AS, Arthanari KK. An in vitro comparative evaluation of distribution of three different sealers by single-cone obturation technique. Journal of pharmacy & bioallied sciences. 2019;11(Suppl 2):S438-441. https://doi.org/10.4103/JPBS.JPBS_64_19.

[19] Komabayashi T, Colmenar D, Cvach N, Bhat A, Primus C, Imai Y. Comprehensive review of current endodontic sealers. Dental materials journal. 2020;39(5):703-20. https://doi.org/10.4012/dmj.2019-288.

[20] Çalışkan MK, Kaval ME, Tekin UĞ, Ünal T. Radiographic and histological evaluation of persistent periapical lesions associated with endodontic failures after apical microsurgery. International Endodontic Journal. 2016;49(11):1011-9. https://doi.org/10.1111/iej.12554.

[21] Akbulut MB, Terlemez A, Akman M, Buyukerkmen B, Guneser MB, Eldeniz AU. Tooth discoloration effects of calcium silicate based barrier materials used in revascularization and treatment with internal bleaching. Journal of Dental Sciences. 2017;12(4):347-53. https://doi.org/10.1016/j.jds.2017.03.009.

[22] Abbott PV. Prevention and management of external inflammatory resorption following trauma to teeth. Australian dental journal. 2016:82-94. https://doi.org/10.1111/adj.12400.

[23] Heboyan A, Avetisyan A, Karobari MI, Marya A, Khurshid Z, Rokaya D, et al. Tooth root resorption: A review. Science Progress. 2022;105(3):00368504221109217. https://doi.org/10.1177/00368504221109217.

[24] Frank AC, Kanzow P, Rödig T, Wiegand A. Comparison of the bleaching efficacy of different agents used for internal bleaching: a systematic review and meta-analysis. Journal of Endodontics. 2022;48(2):171-8. https://doi.org/10.1016/j.joen.2021.10.011.

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