

Endodontic treatment of maxillary lateral incisor with internal root resorption using a hybrid instrumentation technique - case report

Tratamento endodôntico de incisivo lateral superior com reabsorção radicular interna utilizando uma técnica de instrumentação híbrida - relato de caso

Francisco Roosivelt Assis de ARAÚJO¹, Fredson Marcio Acris de CARVALHO¹, André Augusto Franco MARQUES², Emílio Carlos SPONCHIADO JÚNIOR³, Lucas da Fonseca Roberti GARCIA⁴

1 – School of Dentistry – Paulista University – Manaus – AM – Brazil.

2 – Superior School of Health Sciences – State University of Amazonas – Manaus – AM – Brazil.

3 – School of Dentistry – Federal University of Amazonas – Manaus – AM – Brazil.

4 – Department of Restorative Dentistry – Araçatuba School of Dentistry – Univ Estadual Paulista – Araçatuba – SP – Brazil.

ABSTRACT

Several factors influence the cleaning and shaping capacity of instrumentation techniques, such as internal resorption areas. Internal root resorption contributes to failure of endodontic treatment, since debris may remain attached to dentine walls, and the instruments are not able to completely remove them. This paper reports a clinical case of endodontic treatment of a tooth with internal root resorption using a hybrid instrumentation technique. After clinical and radiographic examinations, pulp necrosis with periapical lesion, and the presence of an internal root resorption were diagnosed. Biomechanical preparation began with glide path creation with sizes 15 and 20 K-type files. Apical third instrumentation was performed with rotary ProFile files #25.04 up to #35.04, followed by root canal filling. The case was followed-up for twelve months. Progressive bone repair was observed radiographically. Despite the presence of internal root resorption, the results achieved with the hybrid technique suggest effectiveness in this clinical case solution.

KEYWORDS

Dental pulp cavity; Endodontics; Root canal therapy.

RESUMO

Diversos fatores influenciam a capacidade de limpeza e modelagem das técnicas de instrumentação, como áreas de reabsorção interna. A reabsorção radicular interna contribui para falhas no tratamento endodôntico, uma vez que detritos podem permanecer aderidos as paredes dentinárias, e os instrumentos não são capazes de removê-los completamente. O objetivo deste estudo foi relatar um caso clínico de tratamento endodôntico de incisivo lateral superior com reabsorção interna empregando uma técnica híbrida de instrumentação. Após exames clínico e radiográfico, o diagnóstico foi de necrose pulpar com lesão periapical, além da presença de reabsorção radicular interna. O preparo biomecânico teve início com exploração inicial com limas tipo K #15 e #20. O preparo do terço apical foi realizado com instrumentos rotatórios ProFile #25.04 à #35.04, seguido de obturação. O acompanhamento do caso foi realizado por doze meses. Radiograficamente foi possível observar progressiva reparação óssea. Apesar da presença de reabsorção radicular interna, a técnica de instrumentação híbrida foi eficaz na resolução do caso.

PALAVRAS-CHAVE

Cavidade pulpar; Endodontia; Terapia pulpar.

INTRODUCTION

Root resorption can be classified as internal or external [1]. It is considered physiological when exfoliation of deciduous teeth occurs; and pathological when it results from traumatic injuries, or irritation of the periodontal ligament and pulp tissue of permanent teeth [1]. Also, is usually asymptomatic and diagnosis is accomplished through routine radiographic examination [1].

Pathological internal root resorption is characterized by resorption of the inner surface of dentin adjacent to the granulation tissue produced after an inflammatory process as a result of trauma or stimulus strong enough to cause damage to the pulp tissue [2]. Furthermore, internal resorption may start at any point on the pulp cavity surface [2].

Concerning the absorption mechanism, internal resorption can be classified as inflammatory resorption or replacement resorption [1,2]. In the first situation, resorption of the inner surface of the pulp cavity occurs due to the action of clastic cells adjacent to the granulation tissue of the pulp [1]. In the replacement resorption process, internal resorption is characterized by irregular increase in the pulp cavity and the etiological factor is trauma, typically of low intensity [1,2]. Treatment should be the complete removal of pulp tissue in both situations [2].

Radiographically it is possible to observe that the limits of the endodontic space have a relatively symmetric balloon expansion, showing regular and rounded outline, particularly in the root [3]. A regular outline can also be seen in the dental crown, but the balloon-like shape can rarely be observed [3].

For internal resorption to be active, at least part of the pulp should be vital; however, the pulp may become necrotic after a period of active resorption [1,2]. Although there are

many techniques for biomechanical preparation of root canals, they all have a single objective: provide sufficient enlargement of the root canal to enable adequate debridement of the canal; and filling [4]. Given the limitations of manual and rotary instrumentation methods, protocols must be developed to promote cleaning of the entire root canal space using a technique that emphasizes the main advantages of the two techniques.

It is known that dental trauma is one of the main factors that induces internal root resorption, thus, the aim of this article was to report a clinical case of endodontic treatment of a tooth with partial pulp necrosis with periapical lesion and internal root resorption using a hybrid technique combining manual and rotary instrumentation.

CASE REPORT

The patient, a 52-year-old man, was referred for endodontic treatment of maxillary right lateral incisor. The patient did not have any systemic diseases and was not under any type of medication. In addition, the patient reported no history of dental trauma. On clinical examination, the maxillary right lateral incisor (12) presented spontaneous painful symptomatology, dental discoloration and restoration with infiltration by caries. The cold vitality test was negative and both vertical percussion and palpation in the apical region of the tooth were positive. At the radiographic examination, periapical bone rarefaction and ballooning radiolucency in the middle third of the root was observed, suggestive of internal root resorption. The diagnosis was partial pulp necrosis with periapical lesion and internal root resorption in the middle third of the root (Figure 1a).

After local anesthesia (2% Xylestesin, Cristália Produtos Químicos Farmacêuticos Ltda., Itapira, SP, Brazil) and rubber dam isolation of the operative area, the carious tissue was removed, and access to the pulp chamber

was performed using spherical burs n° 1013 (KG Sorensen, São Paulo, SP, Brazil) and Endo-Z bur for cavity finishing (Dentsply/Maillefer, Ballaigues, Switzerland).

The root canal was initially negotiated with size 15 K-type file (Dentsply/Maillefer). Next, sizes 20 and 25 K-type files (Dentsply/Maillefer) were used up to the estimated working length. Cervical and middle thirds, and the resorption area, were prepared with sizes 3 and 4 Largo burs (Dentsply/Maillefer), followed by real working length determination using an apex foramen locator (Joypex 5, Denjoy, China) (Figure 1b).

Instrumentation of the apical third, and cleaning and shaping of the resorption area were performed with Ni-Ti ProFile files, taper #25.04 up to #35.04 (Dentsply/Maillefer), respecting the working length (18 mm). At each change of instrument, the canal was irrigated with 2.5 ml of 2.5% sodium hypochlorite solution (Biodinâmica, Ibioporã, PR, Brazil).

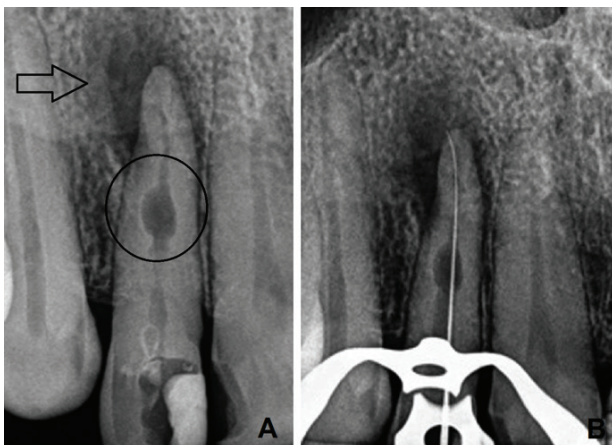


Figure 1 - A) Initial periapical radiograph revealing the presence of periapical lesion (arrow) and internal root resorption (indication) in the middle third of maxillary right lateral incisor. B) Initial root canal negotiation with a size 20 K-type file to determine the temporary working length.

When instrumentation was finalized, 17% EDTA solution was applied in the root canal for 3 min for smear layer removal [5]. The final irrigation was performed with 2.5% sodium hypochlorite solution (Biodinâmica).

After gutta-percha master point fitting and root canal drying with absorbent paper cones (Figure 2a) (Dentsply/Maillefer), filling was performed by thermomechanical compaction technique using a size 45 McSpadden (Dentsply/Maillefer) and N-Rickert sealer (Biodinâmica). Afterwards, the pulp chamber was cleaned to remove the excess of filling material, and glass-ionomer restorative cement (Vidrion R, SS White, Rio de Janeiro, RJ, Brazil) was placed as temporary restoration due to its adequate sealing properties and fluoride release. Composite resin (Z250, 3M ESPE, Sumaré, SP, Brazil) was used for the definitive restoration of the tooth one week later (Figure 2b).

The case was followed-up for twelve months after treatment. Progressive bone repair was observed radiographically and the tooth is clinically asymptomatic (Figure 3).

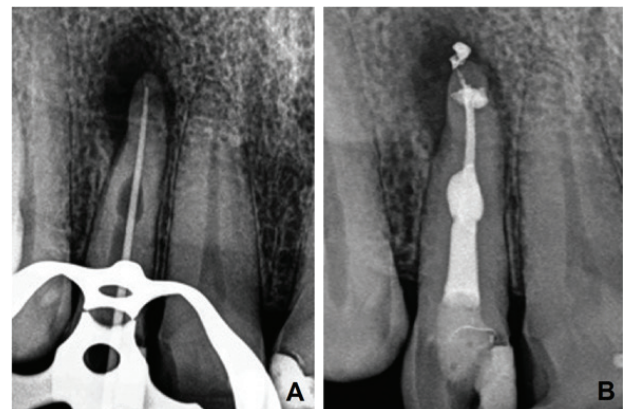


Figure 2 - A) Gutta-percha master point fitting before root canal filling. B) Maxillary right lateral incisor temporarily restored with glass ionomer cement after root canal filling.



Figure 3 - Post-operative periapical radiograph of maxillary right lateral incisor after twelve months, revealing no presence of failure in root canal filling and significant reduction of periapical lesion area.

DISCUSSION

Several attempts have been made to facilitate biomechanical preparation using different instrumentation techniques [4]. Multiple factors influence the cleaning effectiveness of the instrumentation techniques, such as the file type, irrigation solutions, and particularly, the anatomical variations, such as internal resorption areas [4,5]. The modifications in the internal root canal space contribute to the success or failure of endodontic therapy, since debris may remain attached to the dentine walls, when the instruments used are not able to completely remove them [6]. The present article reported a clinical case of endodontic treatment of a tooth with internal root resorption using hybrid instrumentation technique, which uses rotary systems combined with manual files. Gonçalves et al. [6] reported that techniques that use a combination of manual and rotary systems are

more effective to clean root canals than those that only use a rotary instrumentation technique. Furthermore, the authors of the present study chose to use this technique due to the advantages of reduced working time, providing greater comfort to the patient and professionals [7]. In this clinical case, the internal resorption area was initially negotiated with manual K-type files, followed by instrumentation of the cervical and middle thirds, where resorption was present, with Largo burs. Apical finishing was performed with Ni-Ti ProFile files. Several studies have reported the effectiveness of root canal instrumentation by rotary Ni-Ti files, a procedure that is faster than manual preparation [4,7,8]. However, the action of these instruments in tooth with internal root resorption is critical [3]. Ni-Ti files have a restricted area of action due to their superelasticity as the instruments cannot be pressed against root canal walls [4]. Thus, instrumentation needs to be associated with a manual technique, as described in this study [4,6].

Regarding the irrigant solutions used in this clinical case, 2.5% sodium hypochlorite and 17% EDTA were selected for this purpose. Sodium hypochlorite at 2.5% is effective in most endodontic procedures as it promotes deodorization action, solvent activity of organic material, antimicrobial action, and neutralizes toxic substances [5]. In addition, the chelating properties of 17% EDTA helps to remove the smear layer from the surface of the dentinal tubules and maintains them open to allow infiltration of the endodontic sealer [9].

Due to the presence of resorption in the middle third of the root, filling of the root canal was performed using a thermomechanical compaction technique (McSpadden technique). According to Michelotto et al. [10] this technique is more suitable to obturate root canals with internal resorption because it promotes better filling of the internal cavity, which is not possible if only the lateral condensation technique is used.

Thermomechanical compaction technique for root canal filling provides greater flow of gutta-percha, allowing better adaptation of

the filling material to the root canal walls and adequate filling of anatomical details, such as the internal resorption area [10]. In this particular case, the technique was able to promote a satisfactory hermetic sealing of the whole root canal, including the internal root resorption, as seen in Figure 2b.

Another aspect that must be taken into consideration is that it was radiographically possible to observe the presence of surplus after filling. According to Kato e Nakagawa [11], the presence of surplus material favors the high success rate of endodontic treatments because it is believed that the entire root system has been obturated, enabling foramen sealing. In general, endodontic treatment does not fail due to the presence of surplus after filling. In addition, from a biological point of view, root filling materials, as zinc oxide based root canal sealers (N-Rickert), are well tolerated by living organisms, as they could be encapsulated in the periradicular area, do not compromising the endodontic prognosis [11].

The success rate in endodontic therapy of necrotic teeth with periapical lesions can be assessed if there is absence of painful symptomatology and periapical bone repair [12]. Periapical bone repair does not solely depend on biomechanical preparation and filling, but it also depends on the physiological process of the host and the virulent factors of microorganisms present in the root canal. In the present clinical case, the tooth submitted to endodontic therapy presented no painful symptomatology after 6 months of treatment. Radiographically, it was possible to observe a reduction in the periapical lesion, which indicates successful disinfection of the root canal, enables the organism to induce osteogenesis and apical repair and, consequently, maintain the integrity of the lamina dura, despite the overfilling.

CONCLUSION

This case report demonstrated that the hybrid instrumentation technique is a feasible alternative to accomplish root canal instrumentation, particularly in teeth with internal root resorption.

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Lucas da Fonseca Roberti Garcia (Corresponding address)

R. Siró Kaku, n° 72, apto. 73, Bairro Jardim Botânico, CEP: 14021-614, Ribeirão Preto - São Paulo - Brasil. Telephone: +55 (016) 3442-7273.
Email: drlucas.garcia@gmail.com

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