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Case Report

Diagnosis and Management of Root Resorption in Traumatized Teeth: Report of Two Cases

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Abstract

Internal resorption (IR) is a progressive process initiated within the pulp space with the loss of dentin. Although trauma and pulp inflammation/infection are the major contributory factors in the initiation of IR, all the etiologic factors and the pathogenesis have not yet been completely elucidated. Cervical external resorption is defined as a localized resorptive process that commences on the surface of the root below the epithelial attachment and the coronal aspect of the supporting alveolar process, namely, the zone of the connective tissue attachment. This report is presented two cases of root resorption (external cervical resorption and inflammatory IR) in traumatized teeth where cone beam computed tomography has been used as an important diagnostic tool. Treatment of external cervical resorption involved endodontics and periodontics. In case with inflammatory IR, only endodontic treatment was necessary. The postoperative course was uneventful and a stable clinical outcome was obtained.

Keywords: Cone beam computed tomography, dental trauma, root resorption

Introduction

Internal resorption (IR) is a progressive process initiated within the pulp space with the loss of dentin. Although trauma and pulp inflammation/infection are the major contributory factors in the initiation of IR, all the etiologic factors and the pathogenesis have not yet been completely elucidated.[1,2] Cervical external resorption is defined as a localized resorptive process that commences on the surface of the root below the epithelial attachment and the coronal aspect of the supporting alveolar process, namely the zone of the connective tissue attachment.[3,4]

Diagnosis of root resorption is possible after a complete clinical and radiographic examination. Currently, cone beam computed tomography (CBCT) has proven to be an important diagnostic tool in endodontics.[5,6] CBCT scans allow images to be viewed in the axial, coronal, and sagittal slices and are important for the diagnosis of root resorption. In addition, CBCT allows a detailed assessment of the resorbed area so that the exact location and extent can be determined, ensuring the establishment of a more effective treatment plan.[3]

In many clinical cases, the treatment of cervical external resorption involves endodontics and periodontics.[3,4] When surgical intervention to treat progressive external root resorption is necessary, glass-ionomer, resin composite, mineral trioxide aggregate (MTA), and biodentine can be uses for to repair the destroyed area.[3,7,8] In IR, when not communicating with the periodontium, only endodontic treatment is recommended.[3]

This article presents two cases reports of root resorption where CBCT has been used as an important diagnostic tool and has aided in deciding the appropriate treatment plan.

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Case Reports

Case report 1

A 30-year-old woman visited the Dental Trauma Service at the Piracicaba Dental School (University of Campinas) for

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the evaluation of tooth 21. During the anamnesis, the patient reported a bicycle accident at 8 years of age old that caused an enamel and dentin fracture in teeth 11, 12, and 21. Clinically, tooth 21 did not respond to pulp sensitivity testing (Endo–Frost, Roeko, Langenau, Germany), and the patient reported no pain on percussion and palpation. Radiographic examination showed a radiolucent area in the cervical region of tooth 21, thereby suggesting external cervical resorption. No periapical lesion was observed [Figure 1a].

CBCT was performed (Galileos; Sirona Dental, Bensheim, Hessen, Germany) to determine the extent and depth of the lesion in the three spatial levels. Based on the CBCT images and three-dimensional (3D) reconstructions [Figure 1b], a diagnosis of cervical external resorption of Heithersay's[9] class II was determined. The treatment plan included endodontic treatment and surgical intervention for removal of the inflamed granulation tissue that occupied the lesion cavity and repair of the resorption defect with resin-modified glass ionomer cement.

After the patient was anesthetized, the crown was accessed followed by absolute isolation. Root canal was cleaned and shaped up to the size of the R40 (40.06) instrument of the RECIPROC system (VDW, Munich, Germany). Odontometry was performed using an electronic apex locator (Novapex; Forum Technologies, Richion, Le-Zion, Israel). Root canal was irrigated with 2.5% NOCl. All procedures were performed under the magnification of a surgical microscope. Before root canal filling, An Irrisonic E1 (20/.01) tip (Helse Industria e Comercio, Santa Rosa de Viterbo, Brazil) fitted to an ENAC ultrasonic handpiece (Osada Electric Co., Aichi, Japan) set to power 3 was placed 1 mm short of the working length (WL) and first activated with 5 mL 2.5% NaOCl followed by 5 mL 17% ethylenediaminetetraacetic acid (EDTA) and finally with 5 mL 2.5% NaOCl solution. All solutions were renewed and activated by three cycles of 20 s. After drying the canal with paper points, the root canal was filled with gutta-percha plasticized cones and AH Plus sealer (Dentsply Maillefer, Petrópolis, Brazil). The tooth was then sealed with coltosol (Coltene Whaledent, NJ, USA) and composite resin (Filtek; 3M Espe, Sumaré, Brazil) [Figure 1c].

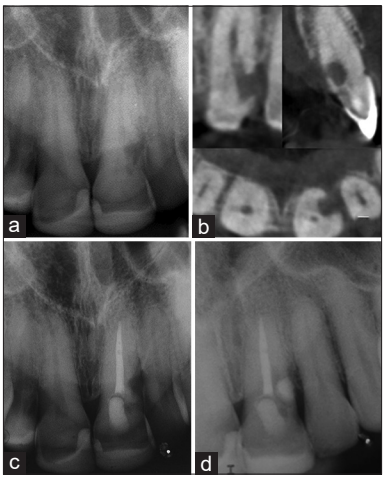

Figure 1: External cervical resorption of maxillary left central incisor. (a) Preoperative periapical radiography. (b) Cone beam computed tomography. (c) Endodontic treatment. (d) 18 months follow-up: Radiographic aspects

After 3 days, the patient reported no symptoms when she returned for surgical repair of cervical external resorption. The patient was anesthetized, and an intrasulcular incision was made with a detachment of the mucoperiosteal flap. The resorption area was exposed, and curettage of the granulation tissue was maintained. Subsequently, the area was irrigated copiously with saline solution, the bleeding was controlled, and the cavity was restored with resin-modified glass ionomer cement (Vitremer; 3M, St. Paul, MN, USA). The area was then closed with sutures, which were removed 7 days later [Figure 2]. After a follow-up of 18 months, the patient reported no symptoms and examination revealed a lack of periapical changes [Figure 1d].

Case 2

A 25-year-old male was referred to the Dental Trauma Service at the Piracicaba Dental School (University of Campinas) for the evaluation of tooth 21. During the anamnesis, the patient reported experiencing dental trauma at 7-year-old, but he did not remember the details of the accident. Clinically, the dental crown was not darkened, and all anterior teeth responded to the sensitivity test (Endo-Frost). The patient reported no pain upon percussion or palpation. Radiographic examination revealed that the absence of periapical lesions, but inflammatory IR in tooth 21 [Figure 3a]. Given these clinical observations, endodontic treatment was indicated.

After the patient underwent anesthetic procedures, cavity access, absolute isolation, and initial instrumentation of the root canal were performed using nickel-titanium hand files (Dentsply Maillefer, Ballaigues, Switzerland). The root canal was irrigated with 2.5% NaOCl during mechanical preparation. During this stage, there was profuse bleeding within the canal. The canal was irrigated with saline solution, and an intracanal medication, which was a combination of 2% chlorhexidine gel and calcium hydroxide, was manipulated and inserted using lentulo spirals. The tooth was sealed coronally with coltosol (Coltene Whaledent) and composite

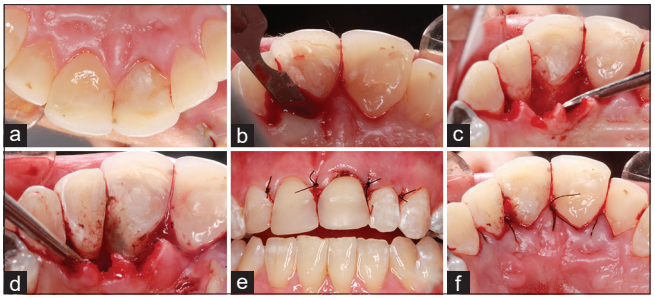

Figure 2: Surgical access of external cervical resorption: (a) Clinical aspects. (b) Incision. (c) Surgical exposure of resorption. (d) Restoration with glass ionomer. (e and f) Clinical aspects after suture

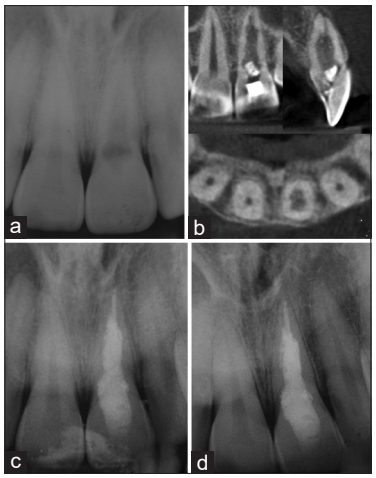

Figure 3: Internal inflammatory resorption of maxillary left central incisor. (a) Preoperative periapical radiography. (b) Cone beam computed tomography. (c) Endodontic treatment. (d) 24 months follow-up: Radiographic aspects

resin (Filtek, 3M Espe). We recommended that the patient undergo CBCT to assess the communication between the resorption and periodontal ligament, which would have justify the profuse bleeding.

The patient returned after 15 days, and he reported no symptoms. The images revealed that the resorption had well-defined limits with the absence of communication [Figure 3b]. Following anesthetization of the patient, the restoration was removed and the tooth was isolated. The intracanal medication was removed with profuse saline irrigation. Odontometry was performed using an electronic apex locator (Novapex, Forum Technologies) and was confirmed by hand files. Instrumentation was completed with ProTaper rotary instruments (Dentsply Maillefer). An Irrisonic E1 (20/.01) tip (Helse Industria e Comercio) fitted to an ENAC ultrasonic handpiece (Osada Electric) set to power 3 was placed 1 mm short of the WL and first activated with 5 mL 2.5% NaOCl followed by 5 mL 17% EDTA and finally with 5 mL 2.5% NaOCl solution. All solutions were renewed and activated by 3 cycles of 20 s. Subsequently, filling was performed using gutta-percha thermoplastification and AH Plus sealer (Dentsply Maillefer). After a follow-up of 24 months, the patient reported no symptoms and examination revealed the lack of periapical changes [Figure 3c and d].

Discussion

Pathological root resorption leads to irreversible loss of tooth structure, and progression of resorption can cause tooth loss if the process is not stopped.[2,3] The main etiological factors of resorption are related to dental trauma, orthodontic movement, internal bleaching, periodontal treatment, and idiopathic causes.[2,3] In this report, the two patients presented with a history of trauma in their anterior teeth.

Diagnosis of root resorption depends on careful clinical and radiographic analysis. Moreover, conventional radiographic techniques have been shown to reveal limited information on the true extent and nature of the resorptive lesion. Thus, CBCT has become an important diagnostic tool for the detection of resorption because it provides 3D imaging.[10-12] Many authors have emphasized the importance of CBCT for the diagnosis and determination of the treatment plan for root resorption. Recent studies[5,12,13] have reported the superior accuracy of CBCT in the detection and location of root resorption compared to periapical radiographs. A CBCT scan was requested for both the cases described in this study. In case 1, the use of CBCT helped to determine the position and depth in relation to the root canal and ultimately, the restorability of the tooth. In case 2, no communication was observed between the root canal and periodontal ligament, ensuring the determination of an appropriate treatment plan.

Treatment of external cervical resorption depends on the extent of resorption. Heithersay[7] divided this condition into four classes according to the degree of damage to the mineralized tissues. Class I corresponds to a small, invasive resorptive lesion near the cervical area with shallow penetration into the dentin; class II corresponds to a well-defined resorptive lesion close to the coronal pulp chamber with little or no extension into the radicular dentin; class III corresponds to a resorptive defect involving the coronal third of the root; and class IV corresponds to a resorptive defect extending beyond the cervical third of the root. In class I and II resorptions, the canal can be preserved and resorption can be restored with composite resin or glass ionomer cement. The prognosis of class III and IV resorptions is more uncertain because the treatment is more complex in these cases.[14,15] In clinical case 1, cervical resorption was classified as type II after examining the CBCT; however, endodontic treatment was performed because the tooth did not respond to pulp sensitivity tests. After surgery, resin modified glass ionomer cement was selected as the material for sealing the resorbed area, as proposed by Heithersay.[9] This cement is an adhesive biocompatible restorative material used in dentistry. It has favorable physical properties similar to those of resin cements while retaining the basic features of the conventional glass ionomer cement.[16]

Another material that can be used in the treatment of external cervical resorption is MTA which presents biocompatibility, good sealing, and ability to form cement.[7] However, this material is more indicated in nonesthetic areas as it can cause tooth discoloration.[16] More recently, biodentine has also been recommended. Biodentine is a new tricalcium silicate-based dentin replacement and repair material which has been shown to possess similar biocompatibility and sealability as MTA.[17,18] However, information on its use in resorptive defect is limited and long-term color stability of biodentine remains unproven.[17,18]

IR is characterized by intraradicular destruction of the dentin and dentinal tubules because of clastic cell action;[2,3] this type of resorption can be confused with external

resorption in many situations. Endodontic treatment is preferred for IR if the tooth can be restored and the prognosis is favorable. The aim of the endodontic treatment is to eliminate the inflamed pulp tissue that can support and stimulate resorption.[2] If no therapy is established, resorption progression may lead to the communication of the root canal with the periodontal ligament. A complete root canal filling with MTA is indicated when communication is present.[2,19,20] In clinical case 2, IR was confined within the root canal. We attempted to preserve as much tooth structure as possible while performing coronal opening during endodontic treatment. Heavy bleeding occurred during instrumentation due to the presence of inflamed pulp and granulation tissue; this impaired our ability to view the canal, even with the aid of a surgical microscope. Therefore, a temporary dressing that included calcium hydroxide and 2% chlorhexidine gel was used between sessions to allow subsequent root canal filling. The use of calcium hydroxide as an interappointment dressing maximizes the effect of disinfection procedures, helps control bleeding, and necrotizes residual pulp tissue.[5,8,21-23]

The IR causes internal cavities in the root canal, changing dental internal anatomy. Therefore, cold lateral compactation is not the most suitable technique for obturation in this cases. Thermoplastic filling techniques are the most recommended. Mittal *et al*.[24] emphasized the importance of thermoplastic filling in their case report. These authors state that thermoplastic gutta-percha promotes 3D obturation in IR. Hegde and Hegde[21] also described this technique for obturation of teeth with IR.

An early and accurate differential diagnosis is essential for the successful treatment of root resorption. The advent of CBCT has helped to improve the clinical diagnosis of resorption. However, because these lesions are asymptomatic in many cases, the use of radiographs during routine dental examinations is essential for the detection of early-stage resorption.

Conclusion

The inclusion of CBCT as a complementary examination in endodontics has facilitated the ability to detect root resorption and to determine the exact location. Clinical and radiographic data allow the clinician to make a differential diagnosis between external and IR and to ensure that an appropriate treatment plan is determined for each case.

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Conflicts of interest

There are no conflicts of interest.

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