MANAGEMENT OF CLASS II INVASIVE CERVICAL RESORPTION USING AN INTERNAL APPROACH: A CASE REPORT

MANEJO DE REABSORÇÃO CERVICAL INVASIVA CLASSE II ATRAVÉS DE ABORDAGEM INTERNA: RELATO DE CASO

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ABSTRACT

Invasive cervical resorption (ICR) is a pathology that causes the loss of hard tissue by odontoclast action, which mostly occurs due to dental trauma. Treating this condition requires an internal and/or external approach to remove the resorptive tissue and subsequently fill this area with a bioactive and biocompatible material. This study reported an ICR case in an endodontically treated tooth of a patient with a history of dental trauma and endodontic treatment in dental unit 21. The diagnosis was determined radiographically and confirmed by cone-beam computed tomography (CBCT). The lesion was classified as Heithersay class 2 and Patel class 2Ad, without communication with the root canal. The treatment involved a minimally invasive internal approach to remove the resorptive tissue using ultrasonic inserts, with calcium hydroxide as an intracanal medication, and filling the cavity with Bio-C Repair® bioceramic cement. Surgical microscopy aided the procedure, providing precision and safety. The report highlights the relevance of technological resources, such as CBCT, ultrasound, and microscopy, in assisting the diagnosis and execution of conservative and predictable treatments.

KEYWORDS: Endodontics, tooth resorption, dental trauma.

RESUMO

A reabsorção cervical externa do tipo invasiva (RCI) é uma patologia que acarreta a perda de tecido duro por ação de odontoclastos, que ocorre, em sua maior parte, devido a traumatismos dentários. O tratamento desta condição requer uma abordagem interna e/ou externa que visa à remoção do tecido reabsortivo e posterior preenchimento desta área com um material bioativo e biocompatível. O objetivo deste trabalho é relatar um caso de RCI em um dente tratado endodonticamente de uma paciente com histórico de trauma dental e presença de tratamento endodôntico prévio na unidade 21. O diagnóstico foi realizado por radiografia e confirmado por Tomografia Computadorizada de Feixe Cônico (TCFC). A lesão foi classificada como classe 2 de Heithersay e 2Ad de Patel, sem comunicação com o canal radicular. O tratamento adotado foi abordagem interna minimamente invasiva, com remoção do tecido reabsortivo através de insertos ultrassônicos, uso de hidróxido de cálcio como medicação intracanal e preenchimento da cavidade com cimento biocerâmico Bio-C Repair®. O procedimento foi realizado com auxílio de microscopia operatória, proporcionando precisão e segurança. O relato destaca a importância do uso de recursos tecnológicos, como a TCFC, ultrassom e microscopia auxiliando no diagnóstico e execução de tratamentos conservadores e previsíveis.

PALAVRAS-CHAVE: Endodontia, reabsorção de dente, traumatismos dentários.

1. INTRODUCTION

Root resorption is the loss of hard dental tissue (cementum and dentin) due to odontoclast action[1]. The literature mentions several etiological factors of dental root resorption, highlighting trauma and iatrogenic factors[2]. Root resorptions can be classified as internal (from the pulp) and external (from the periodontal ligament)[3]. External root resorption may be further categorized into surface, inflammatory, replacement, invasive cervical, and transient apical resorption[1].

Invasive cervical resorption (ICR), identified and defined by Heithersay, is a clinical term to describe a relatively uncommon, insidious, and often aggressive form of external tooth resorption, which may occur in any permanent dentition tooth[4]. However, it is most frequent in upper anterior teeth and begins in the small gaps or spaces of the cementoenamel junction[5]. An epidemiological study estimates ICR prevalences from 0.02% to 0.08%[6].

The pathogenesis of ICR includes three main stages: resorption onset, characterized by a localized disruption of the regular structure of the periodontal ligament; resorption progression, comprising stimulating factors such as bacteria, continuous mechanical strength in the periodontal ligament, and discontinuous mechanical discharge; and the repair stage, where osteoblast-like cells perform the repair by growing an internal bone-like tissue in the resorption cavity[7]. The evolutionary process of ICR may present an irregular and random pattern, first expanding coronally and then apically, surrounding the root canal[8].

The ICR diagnosis may occur in later stages, when

the destruction of the dental structure becomes evident, as it usually starts below the epithelial insertion and does not present visual signs[6]. Sensitivity tests are mandatory for a differential diagnosis[3]. Radiographically, the lesion is an irregular radiolucency within the tooth[9]. However, conventional periapical radiography produces two-dimensional images, whereas cone-beam computed tomography (CBCT) offers three-dimensional imaging, allowing for more accurate assessment of lesion extent and improved treatment planning[10].

Heithersay (1999)[4] proposed the best-known ICR classification, considering the size and severity of the radiographically visible lesion. Class 1 presents a small resorptive lesion near the cervical area with superficial penetration into the dentin; class 2 denotes a resorptive lesion penetrating near the coronal pulp chamber; class 3 demonstrates an extension to the coronal third of the root; and finally, class 4 extends the resorptive process beyond the coronal third of the root[11].

Patel *et al*. (2018)[7] proposed a three-dimensional classification, analyzing lesion size, circumferential extension, and proximity to the root canal. Regarding size or height, the lesion is graded in four types according to its maximum vertical extension: 1 - supracrestal; 2 - subcrestal, extending to the coronal third of the root; 3 - extending to the middle third of the root; and 4 - extending to the apical third of the root. Lesion circumference is graded in four classifications according to its maximum spread around the root: A - ≤ 90°; B - > 90° to ≤ 180°; C - > 180° to ≤ 270°; and D - > 270°. Axial sections of the CBCT show the lesion's proximity to the root canal: d - lesion confined to the dentin, and p - lesion with probable pulp involvement.

The treatment of ICR lesions has focused primarily on removing clastic cells to interrupt the resorption process and adequately restore the dental structure, aiming at preserving its integrity[12]. Currently, the restoration materials of choice include biocompatible substances, such as MTA (Dentsply-Tulsa Dental, Johnson City, TN, USA) or Biodentine (Septodont, Saint-Maur-des-Fossés, France), as well as materials with superior aesthetic properties, such as composite resins[13]. When the lesion's entry point is in the supraosseous region, the external approach is the most appropriate. In cases of small and usually inaccessible entry points, the internal approach is recommended with endodontic treatment and restoration of the resorption defect[14].

This study reports an ICR case - Heithersay class 2 and three-dimensional classification 2Ad - in which the chosen treatment was resorptive tissue debridement and subsequent filling of the area with bioceramic cement aided by ultrasonic devices and surgical microscopy, using an internal approach.

2. CASE REPORT

The case report was submitted for review to the Herrero School Local Ethics Committee and approved under Opinion No. 483.537.

A 27-year-old female patient attended an appointment at the Gois Aguiar Institute post-graduate school in Aracaju, Sergipe, Brazil, complaining of discomfort in the region of upper central incisors.

During anamnesis, the patient reported that, at the age of 20, she fell near the edge of a pool and fractured three dental units (DUs): 11, 21, and 22. Fifteen days after the trauma, she underwent endodontic treatment and composite resin restoration in DU 21. Two years later, a chromatic change appeared in the treated tooth, accompanied by mild discomfort in the region of the upper central incisors. The initial periapical radiograph showed no significant changes. However, a CBCT performed in 2022 enabled the diagnosis of ICR in DU 21. The patient sought care only in February 2024. Anamnesis, intraoral clinical examination, and the initial periapical radiography were performed (Figure 1). Percussion and palpation tests were normal for DU 21. Considering these findings, a new CT scan was requested for a more accurate and updated evaluation of the condition.

Figure 1. Initial radiographic appearance of upper central incisors, February 2024. **Source:** authors, 2025.

The imaging test results allowed for initial planning for the tooth in question. The tomographic sections showed an area of irregular resorption in the mesial region (Figure 2A, 2B), compatible with the ICR diagnosis without communication with the root canal, as well as endodontic treatment without evidence of failure and/or association of periapical lesion.

The lesion's entry point was approximately 1.7 mm long, located in the mesial region, and stood in a subcrestal position. An adjacent hypodense area was observed, compatible with the evolutionary stage of the resorption process. The resorptive lesion was classified as Heithersay class 2 with proximity to the coronal pulp

chamber and little extension in the root dentin, and 2Ad in the three-dimensional classification by Patel *et al.* (2018)[7].

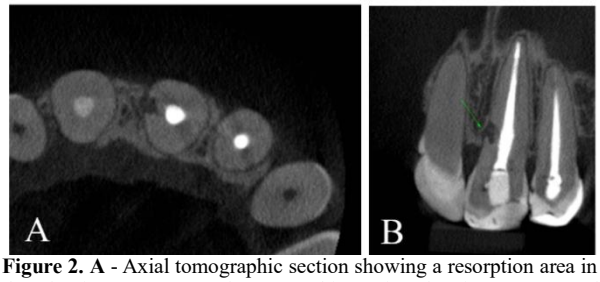

Figure 2. A - Axial tomographic section showing a resorption area in dental unit 21. **B** - Coronal tomographic section showing an aspect of invasive cervical resorption (arrow). **Source:** authors, 2025.

The treatment plan comprised an internal approach to access the resorptive area via root canal, subsequently filling the area with a biocompatible and bioactive material, without performing endodontic retreatment. Considering that the resorption entry point was small and subcrestal, an external surgical approach was not viable.

In the first session, local infiltration anesthesia was performed in the region of DU 21 with 1.5 tubes of 2% lidocaine with 1:100,000 Epinephrine anesthetic (Alphacaine 100, DFL®, Rio de Janeiro, Brazil). After absolute isolation, the root canal was accessed (Figure 3A) using a 1014 HL diamond tip (KG Sorensen®, Espírito Santo, Brazil). After locating the gutta-percha, Clearsonic Black R1 ultrasonic inserts removed the filling material below the resorption area (Helse Ultrasonic®, São Paulo, Brazil), and E7D (Helse Ultrasonic®, São Paulo, Brazil) removed the dental tissue to reach the resorptive area, aided by an ultrasound device (Ultrasound Advance View 1, Microdont®, São Paulo, Brazil) (Figure 3B).

Next, the granulation tissue was cauterized using a gutta-percha thermocompactor (fast PACK-Termocompactador para Gutta, MK Life®, Rio Grande do Sul, Brazil) (Figure 3C). The cavity was irrigated with sterile saline and filled with calcium hydroxide medication (Calcium Hydroxide P.A., Biodinâmica®, Paraná, Brazil) and sterile saline. Foam pellets (Tim Skin, Voco®, Cuxhaven, Germany) and glass ionomer cement (Maxxion R Restorative Glass Ionomer, FGM®, Santa Catarina, Brazil) were used for sealing. All stages used surgical microscopy (Surgical Microscope – 12, DF Vasconcelos®, Rio de Janeiro, Brazil) with 8x and 12.5x magnifications.

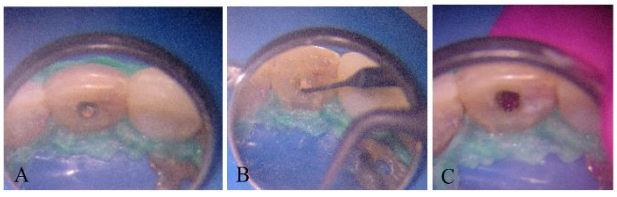

Figure 3. A - Root canal access with filling material localization. B - Removal of filling material using the Clearsonic Black R1 ultrasonic insert. C - Clinical appearance of the lesion area after removing the resorption tissue. **Source:** authors, 2025.

During the second session, conducted 30 days after the initial appointment, anesthesia, absolute isolation, and access cavity preparation were carried out following the same protocol as before. Abundant irrigation of 2.5% sodium hypochlorite (Soda Chlororada, Asfer®, São Paulo, Brazil) removed the calcium hydroxide medication. A final irrigation with sterile distilled water was performed, and the area was completely dried, aided by an endodontic suction kit (Capillary Tips, Ultradent®, São Paulo, Brazil) and #70 sterile paper points (All Prime®, Santa Catarina, Brazil).

The resorption area was filled with Bio-C Repair bioceramic cement (Angelus®, Paraná, Brazil) aided by a Schilder 3-4 plugger (Odous de Deus®, Minas Gerais, Brazil)**.** A periapical radiography verified the correct local filling, and finally, the glass ionomer cement (Maxxion R Restorative Glass Ionomer, FGM®, Santa Catarina, Brazil) was inserted, temporarily sealing the region (Figure 4A).

In the third and final session, the glass ionomer cement was completely removed using a 1014 diamond tip and an E6D ultrasonic insert, allowing the visualization of the underlying bioceramic cement. Then, the region was etched with 37% phosphoric acid (Fusion Duralink 37% Phosphoric Acid Primer, Angelus®), washed, dried, and received an adhesive system (Adhesive Ambar, FGM®, Santa Catarina, Brazil) applied with a microapplicator (All Prime®) and light-cured for 20 seconds.

The region was filled with bulk fill resin (Bulk Fill SDR Plus Flow Resin, Dentsply Sirona®, NC, USA), spreading before light-curing with a #40 lentulo spiral (Maillefer, Dentsply Sirona®). An EA2 nanoparticulate composite resin (Epic Resin, Biodinâmica®, Paraná, Brazil) was used to complete the occlusal adjustment and finalize the restoration (Figure 4B).

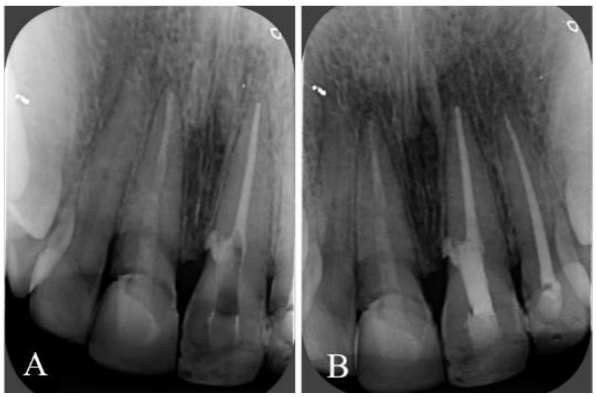

Figure 4. A - Radiographic appearance after filling with bioceramic cement and temporary restoration with glass ionomer cement. B - Final radiography after the definitive restoration. **Source:** authors, 2025.

3. DISCUSSION

Root resorption classifications are based on several parameters, such as resorption site, lesion size, histological condition, etiopathogenetic peculiarities, and radiographic observations[2].

Based on the radiographic evaluation, the lesion in question is classified as Heithersay class 2, denoting a

well-defined invasive resorptive lesion that penetrates near the coronal pulp chamber but shows little or no extension in the root dentin. The Heithersay classification is often more straightforward and requires only a single periapical radiograph, which is typically the first imaging test available to clinicians when evaluating a tooth affected by this type of resorption.[9]. However, it is well established that periapical radiography reveals limited information about dentoalveolar anatomy due to its two-dimensional nature, geometric distortion, and anatomical noise[7].

CBCT is highly recommended for diagnosing and evaluating resorptive lesions before treatment, as presented in the joint position statement of the American Association of Endodontists/American Association of Oral and Maxillofacial Radiology and the position statement of the European Society of Endodontology on the use of CBCT in Endodontics[12]. This method can overcome image interpretation challenges by allowing clinicians to visualize the dentition and the relationship of anatomical structures in three dimensions[15].

Regarding the three-dimensional classification proposed by Patel *et al*. (2018)[7], the lesion has a 2Ad configuration, as it extends to the coronal third of the root and apical to the bone crest, presents a circumferential propagation equal to or lower than 90º, and is confined to dentin, without communication with the root canal. Additionally, the internal approach requires localized dentin wear soon after wearing the filling material to expose the resorption area, corroborating the fact that the lesion is confined to dentin.

The correct ICR diagnosis based on clinical and radiological examinations is an essential prerequisite for successful treatment[13]. There is an evident need for guidelines to instruct this diagnosis, choose the factors for consideration, and plan the most effective therapeutic option[16]. Invasive cervical resorption lesions are usually asymptomatic, although there may be mild discomfort or irritation of surrounding gingival tissues[10]. In this specific DU, the patient only complained of sporadic mild discomfort, which only started a few years after the initial trauma.

An ICR treatment depends on the severity and location of the resorptive defect, as well as tooth restorability[14]. The literature describes different ICR treatment approaches. Although external surgical techniques are commonly employed, this case applied a minimally invasive internal approach, as it is indicated when the entry point is small, located intraosseously, and apical to the epithelial attachment[17]. This method maintains the root surface virtually intact, and the mechanical or chemical removal of the resorptive tissue is performed during endodontic treatment[13,18].

Calcium hydroxide dressing may represent an alternative treatment modality for various root resorptions[3]. The calcium hydroxide paste may be applied as an interappointment medicament to the resorptive defect if the fibrovascular tissue exhibits persistent bleeding[14]. The high alkaline pH of calcium hydroxide may induce limited necrosis of resorptive cells on the root surface and exhibit antibacterial activity[19]. In the present case, the first treatment session used calcium hydroxide medication as complementary therapy in the resorption area.

Sodium hypochlorite is the gold standard among root canal irrigants due to its antibacterial activity and tissue-dissolving properties, which result from direct contact with organic matter. In this process, available free chlorine molecules promote the degradation and hydrolysis of amino acids[20]. In this treatment approach, the critical step of removing the resorptive tissue was based on the dissolution effects of sodium hypochlorite and calcium hydroxide, as well as the studies by Shemesh *et al*. (2019)[18] and Heboyan *et al*. (2022)[2].

The defect was filled with Bio-C Repair® (Angelus, Londrina, PR, Brazil), a ready-to-use calcium silicate bioceramic cement presenting biocompatibility properties, easy application, and adequate consistency. This choice aligns with the literature, which indicates MTA and bioceramics as the gold-standard materials in these cases[19]. This cement serves as a barrier against microorganisms, promotes tissue healing, and does not cause discoloration of the crown[21,22]. MTA and other dentin substitutes are often the preferred materials for filling resorptive cavities, particularly when there is communication with the periodontium[23].

4. CONCLUSION

This case report highlights the complexity of managing invasive cervical resorption lesions, beginning with the diagnostic phase, which demands a high level of clinical expertise and experience from professionals. Such situations highlight the importance of complementary resources in supporting and guiding decision-making in clinical practice. Cone-beam computed tomography stood out as an indispensable tool in this process, significantly contributing to the predictability of therapeutic success. Additionally, surgical microscopy enabled the magnification of the operative field, offering more detail and accuracy during the procedures, thereby increasing treatment safety and efficacy.

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