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Invasive cervical resorption: case report

Reabsorção cervical invasiva: relato de caso

Resorción cervical invasiva: reporte de caso

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Abstract
Invasive cervical resorption (ICR) is an insidious, aggressive, and asymptomatic form that can lead to destruction and even loss of the dental unit. ICR is somewhat uncommon, but it can affect any tooth, with the maxillary central incisors being the most affected. Even after numerous studies, the etiology is still unclear. There are some predisposing factors, including orthodontic treatment, trauma, and internal tooth whitening, which may occur in isolation or in conjunction with each other. This article reports a clinical case of ICR class 3 with a rosy discoloration at the cervical margin and the presence of a fistula associated with a history of trauma. This suspicion was raised after radiographic examination and confirmed by cone-beam computed tomography (CBCT), with treatment via an internal approach and endodontic treatment involving debridement of the resorptive areas and filling with a bioceramic repair material and suturing. After treatment, the patient remained asymptomatic, but the fistula was no longer present. Prospective observation at 10 months showed bone formation in the middle third and well-adapted material in the cervical region, with no resorptive tissue present.
Keywords: Bioceramic cement; Computed tomography; Etiology; Invasive cervical resorption; Radiography.

Resumo
A reabsorção cervical invasiva (RCI) é uma forma insidiosa, agressiva e assintomática que pode levar à destruição e até mesmo à perda da unidade dentária. A RCI é um tanto incomum, mas pode afetar qualquer dente, sendo os incisivos centrais superiores os mais comumente afetados. Mesmo após vários estudos, a etiologia ainda não é clara. Existem alguns fatores predisponentes, incluindo tratamento ortodôntico, trauma e clareamento dentário interno, que podem ocorrer isoladamente ou em conjunto. Este artigo relata um caso clínico de classe 3 do CICV com uma descoloração rosada na margem cervical e a presença de uma fístula associada a uma história de trauma. A suspeita foi levantada após exame radiográfico e confirmada por tomografia computadorizada de feixe cônico (TCFC), com tratamento por via interna e tratamento endodôntico envolvendo desbridamento das áreas reabsortivas e preenchimento com material de reparo biocerâmico e sutura. Após o tratamento, o paciente permaneceu

assintomático, mas a fístula não estava mais presente. A observação prospectiva aos 10 meses mostrou formação óssea no terço médio e material bem adaptado na região cervical, sem presença de tecido reabsortivo.
Palavras-chave: Cimento biocerâmico; Tomografia computadorizada; Etiologia; Reabsorção cervical invasiva; Radiografia.

Resumen
La reabsorción cervical invasiva (RCI) es una forma insidiosa, agresiva y asintomática que puede provocar la destrucción e incluso la pérdida de la unidad dental. La ICR es algo poco común, pero puede afectar a cualquier diente, siendo los incisivos centrales superiores los más afectados. Incluso después de numerosos estudios, la etiología aún no está clara. Existen algunos factores predisponentes, incluidos el tratamiento de ortodoncia, los traumatismos y el blanqueamiento interno de los dientes, que pueden ocurrir de forma aislada o en conjunto. Este artículo reporta un caso clínico de clase 3 del CICR con una coloración rosada en el margen cervical y la presencia de una fístula asociada a un antecedente de trauma. Esta sospecha se planteó tras el examen radiográfico y se confirmó mediante tomografía computarizada de haz cónico (CBCT), con tratamiento por vía interna y tratamiento endodóntico con desbridamiento de las áreas de reabsorción y relleno con material de reparación biocerámico y sutura. Después del tratamiento, el paciente permaneció asintomático, pero la fístula ya no estaba presente. La observación prospectiva a los 10 meses mostró formación de hueso en el tercio medio y material bien adaptado en la región cervical, sin presencia de tejido de resorción.
Palabras clave: Cemento biocerámico; Tomografía computarizada; Etiología; Reabsorción cervical invasiva; Radiografía.

1. Introducion

Tooth resorptions are characterized by the destruction of mineralized tissue due to the activity of resorptive cells, resulting in the loss of tooth structures responsible for the protection and insertion of teeth into the alveoli. They occur when the protective structures of the teeth are eliminated in relation to bone remodeling, especially the cementoblasts and the epithelial remnants of Malassez. Clinically, tooth resorptions are asymptomatic and do not lead to changes in the pulp, periapical area, and periodontium. (Consolaro, 2011).

Dental resorption can be classified as external, internal or communicating resorption, with different causes and characteristics, and the presence of one does not exclude the manifestation of the other, both of which can be present in the same dental unit (Pindborg, 1970; Camargo et al.,2008). Cervical resorption is a physiological or pathological process that attacks the root surface, causes loss of cervical tooth tissue, and can lead to irreversible damage to the tooth (PATEL,2007). External cervical resorption, or preferably defined as invasive cervical resorption (ICR) by Heithersay 1999, is a rather aggressive form of external tooth resorption that is usually painless unless pulp or periodontal infection is present (Heithersay, 2004).

Although there are several predisposing factors, the etiology and pathogenesis are poorly understood. However, it is known that the process is driven by odontoclasts that initially pierce the tissues with small entry points and then spread (Schwartz et al., 2010). There are several factors that can damage the cervical area of the root surface and thus trigger ICR, including: orthodontic treatment, trauma, internal bleaching, delayed eruption, periodontal therapy, and restoration, some of which may occur alone or in combination (Heithersay, 1999a; Trope, 2002). Von et al. (2009) reported a viral etiology associated with the detection of feline herpesvirus type I after studies of 4 patients with multiple teeth affected by ICR, suggesting transmission of feline viruses to humans.

Heithersay (2004) classified ICR into classes for diagnostic purposes based on the extent of the lesion within the tooth: Class 1, a small invasive resorption lesion near the cervical area of the tooth with superficial penetration into the dentin; Class 2, a well-defined invasive resorption lesion that has penetrated near the coronal pulp chamber but with little or no extension into the root dentin; Class 3, a deeper invasion of the dentin by resorption tissue involving the coronal dentin and extending at least to the coronal third of the root; and Class 4, an invasive resorption process extending beyond the coronal third of the root canal.

In the case of ICR, as indicated by the European Society of Endodontology, 2014 and the American Association of Endodontists/American Association of Joint Position Statement of Oral and Maxillofacial Radiology, 2015, Cone beam computed tomography CBCT should be recommended for the evaluation and treatment of root resorption but does not exclude the need for periapical radiographs (Consolaro, 2007). So that a new three-dimensional classification has emerged, leading to the consideration of 3 dimensions: Height of the lesion, 1: At the level of the cementum enamel or coronal junction to the bone crest (supracrestal), 2: Extends to the coronal third of the root and apical to the bone crest (subcrestal), 3: Extends to the middle third of the root, and 4: Extends to apical third of root; circumferential spread, A: ≤90°, B: > 90° to ≤180°, C: > 180° to ≤270°, and D: > 270°; and proximity to root canal, d: Lesion confined to dentin, and p: Probable pulp involvement; aims to enable effective and accurate communication of ICR lesions among colleagues (Patel et al., 2018a).

A correct diagnosis, along with an ICR assessment, is essential to a successful treatment. Clinically, ICR presents as cervical cavitation with irregularities in gingival contour and/or enamel discoloration (Patel et al. 2016). Diagnosis is difficult because there are no signs or symptoms even in the most severe form (Pace et al., 2008). The identification and evaluation of the ICR lesions depends on the interpretation of radiographs, as they occur in subgingival areas and can spread axially, horizontally, and circumferentially as they penetrate the dentin (Gunst et al., 2013).

Based on the detailed assessment of the size and location of the ICR lesion using CBCT, surgical or nonsurgical treatment can be selected as an approach (Rotondi et al., 2020). Treatment, if indicated, should aim to inactivate all tissue that is resorbed and to maintain the structural integrity of a tooth with an adequate restoration, whether with an internal or external approach (Heithersay, 2004).

In summary, the purpose of this article is to describe the treatment of a Class 3 ICR in which treatment was performed with therapeutic success.

2. Case Report

A clinical case of internal root resorption was approved by the local research ethics committee. Patient M. A. R., male, 28 years old, in good general health, presented to a private practice after being referred for endodontic evaluation of teeth 11 and 21. During anamnesis, the patient stated that he had suffered trauma to the face during sports activities for about 5 years. Clinically, a pinkish stain was observed in the disto-vestibular cervical region and a fistula associated with tooth 11 (Figure 1).

Figure 1: Pinkish stain of the tooth and fistula.

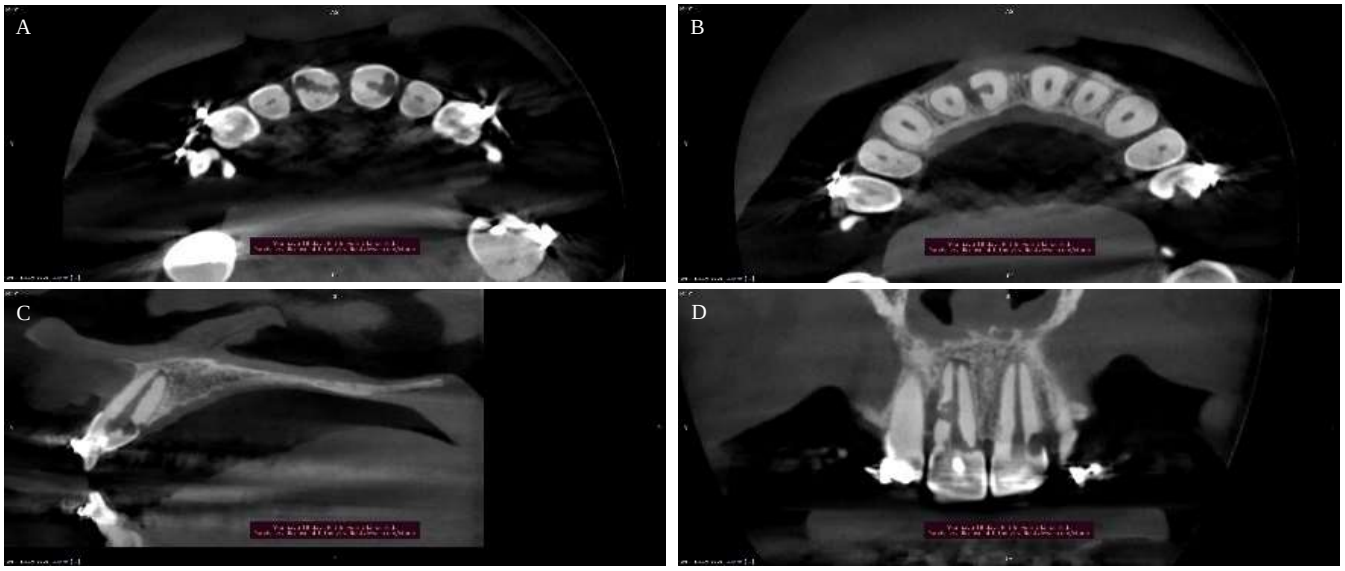
Source: Own authorship.

Tests of vertical percussion and pulp sensitivity to cold were negative, and periodontal probing with physiologic depth (< 3mm) was performed on all sides except the distal side, where examination revealed a periodontal pocket of 11 mm and abundant bleeding.

Initial radiographic examination revealed irregular radiolucent areas in the cervical (distal and mesial) and middle third (distal) and no visible periapical radiolucent lesions. CBCT were indicated to assess the extent and classification of the resorptive lesions and to plan appropriately.

On CBCT examination (Figure 2), possible entrance doors of ICR were observed with hypodense images in the cervical region (mesial and distal) and invasion of the pulp chamber, extensive hypodense images in the middle third (distal side) with periodontal communication in addition to apical external resorption.

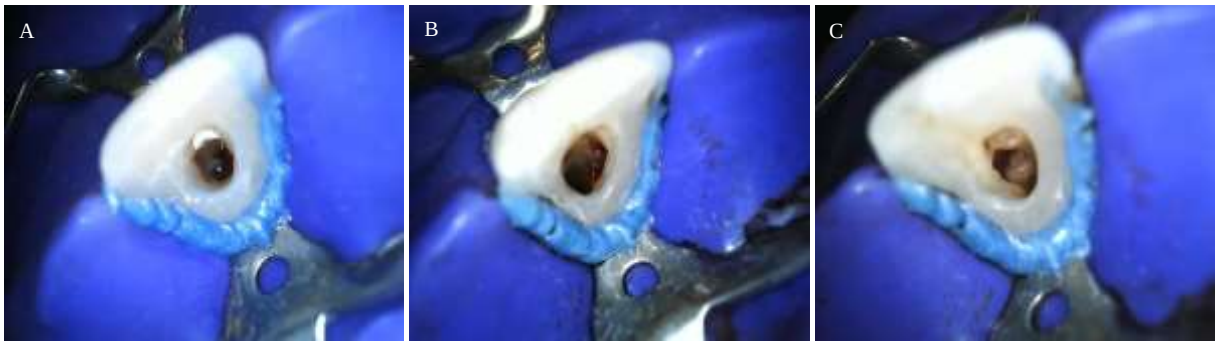
Figure 2: (A) Axial section in the cervical third; (B) Axial section in the middle third; (C) Sagittal section; and (D) Coronal section.



Source: Own authorship.

Treatment of the root canal with debridement of the resorptive areas and filling of the gaps with bioceramics was the treatment of choice. The entire treatment was performed under the surgical microscope. After anesthesia with lidocaine 1:100,000 (DFL, Rio de Janeiro-RJ), the tooth was isolated with a rubber dam and the coronal access was performed. Thus, debridement of the granulation tissue in the cervical region was initiated with the P1 surgical ultrasound insert (Helse Ultrasonic, Santa Rosa de Viterbo - SP) and 00F E00L micro curettes (Trinks, São Paulo - SP) and extensive irrigation with saline (Farmax, Jovelino Rabelo- MG) until no tissue was visible and hemostasis could be promoted (Figure 3).

Figure 3: (A) Coronary access; and (B) and (C) Debridement and hemostasis.



Source: Own authorship.

Thereafter, chemical mechanical preparation began with manual K-type instruments (Dentsply Sirona, York, Pennsylvania, USA), stepwise and in thirds, alternating with rinsing with the auxiliary chemical of choice, NaOCl at 2.5% (Asfer, São Caetano do Sul - SP). The Working Length (WL) was set at 22.5 mm after tomographic measurement and clinically confirmed by radiographic odontometry with the initial apical instrument #45 and the memory instrument set in #60.

After chemical mechanical preparation, the auxiliary chemical was agitated using the Irrisonic insert (Helse Ultrasonic, Santa Rosa de Viterbo - SP) and the root canal walls were whipped with the XPEndo Finisher (FKG Dentaire, La Chaux-de-Fonds, Switzerland) until there was no more bleeding from inside the root canal. Then, the root canal was dried with sterile absorbent paper tips (MK Life, Porto Alegre - RS), a calcium hydroxide- based intracanal drug, Ultracal (Ultradent, Indaiatuba - SP), was applied through the entire root canal, including the resorptive areas in the cervical region, and a temporary seal was made with a sterile sponge and composite resin (3M, Sumaré - SP).

The second session was performed 10 days after the first treatment. No fistula was observed, and the patient did not report painful symptoms. After anesthesia and rubber dam placement, the temporary restorative material and intracanal medication were removed with extensive irrigation with saline. Removal of the intracanal medication revealed the absence of granulation tissue in the cervical region (Figure 4).

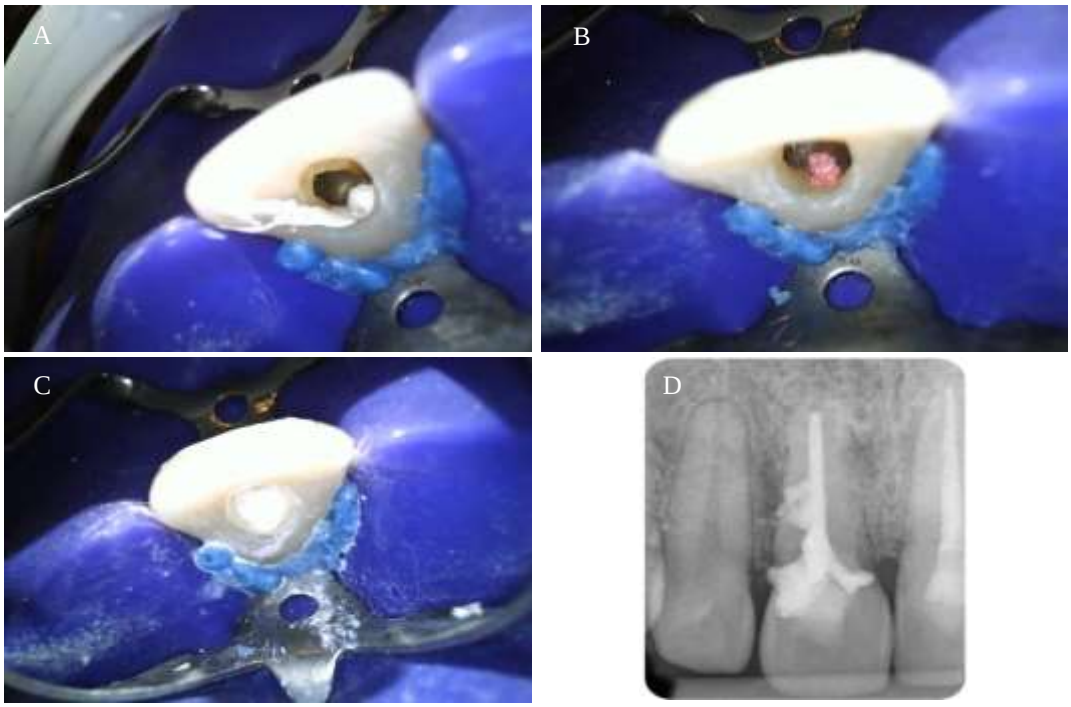
Figure 4: Absence of granulation tissue.

Source: Own authorship.

The root canal was dried by an aspiration cannula placed on the WL, and then only an absorbent paper tip was used.

Filling was performed with the insertion of the bioceramic obturator, Bio-C Sealer (Angelus, Londrina - PR), up to the entrance of the root canal and with the single cone technique. The ICR entries located in the cervical area were sealed with the restorative bioceramic Bio-C Repair (Angelus, Londrina - PR) and all restored entries (Figure 5) were sealed with composite resin (3M, Sumaré - SP).

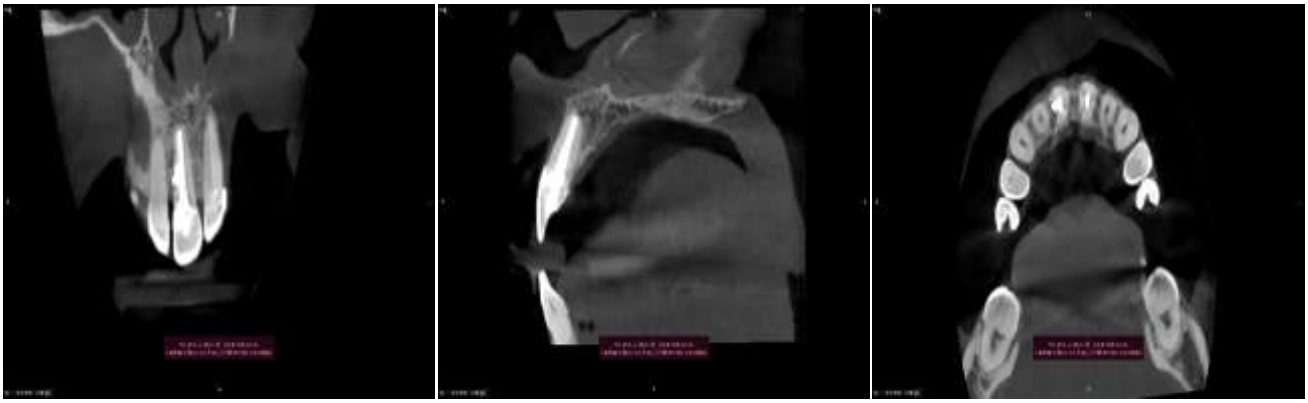
Figure 5: (A), (B) and (C): Filling with bioceramics, guta percha and temporary sealer; (D) Final radiograph.



Source: Own authorship.

Proservation was performed 10 months after completion of treatment. Clinically, no fistula was observed, periodontal probing compatible with the physiological pattern (< 3mm) on all sides of the tooth, and no painful symptomatology were noted. On control CBCT examination (Figure 6), bone formation was observed in the middle third and well adapted material in the cervical region.

Figure 6: Control tomography after 10 months**.**



Source: Own authorship.

3. Discussion

A relatively rare form of external root resorption is ICR, which is difficult to recognize because of its lack of symptoms and may present clinically as a small defect at the gingival margin or even as pink coronal discoloration of the tooth, resulting in cavitation of the enamel (Heithersay, 1999b). The patient in question showed no painful symptoms, only clinical

signs such as a pinkish discoloration and the presence of a fistula in unit 11, in addition to a history of trauma to the anterior aspect of the maxilla approximately 5 years ago.

A study of 284 patients in which a total of 337 teeth were affected by ICR concluded in one of its findings that the maxillary central incisors had a higher incidence of pathology (Mavridou et al., 2017). Another study of a group of 222 patients, in an attempt to identify predisposing factors for ICR, came to results associated with trauma, which was the second most common isolated factor, accounting for 14.0% of patients, with another 11.2% observed in combination with internal bleaching, orthodontics, or delayed eruption. (Heithersay, 1999a).

In several studies, radiographic examination, often routinely performed, was crucial for the diagnosis of ICR, especially periapically (Heithersay, 1999b; Bharti et al., 2014; Kumar et al., 2015). In the present case study, ICR was suspected by periapical radiography, which was confirmed after CBCT, allowing classification as class 3 (Heithersay, 2004) or according to the new 2Ap classification. (Patel et al., 2018a)

CBCT is best suited to obtain a more accurate diagnosis of this pathology (Patel et al. 2014), as the extent of the lesion can be better observed in the three spatial planes. (Estevez et al., 2010; Patel et al. 2014). In addition, periapical radiography has significant limitations in assessing the extent and nature of ICR, and its isolated use can lead to misdiagnosis and poor formulation of a treatment plan (De Souza et al., 2017; and Patel et al. 2018b).

Proper case selection is important to achieve a good prognosis, such that treatment in class 1-3 is more likely to be successful, whereas class 4 has a higher risk of failure due to the extent of the lesions (Heithersay, 2004). Typically, nonsurgical approaches require mechanical or chemical removal of the resorptive tissue during root canal treatment (Heithersay, 1999c). Numerous authors advocate the use of the internal approach, in which lesions are accessed through the endodontic access cavity without the need for surgical intervention (Salzano & Tirone, 2015; Eftekhar et al. , 2017; Shemesh et al. , 2017; Asgary et al., 2019;), which was performed in the present case because of the possibility of removing the resorption tissue present in the lesion.

Trichloroacetic acid 10% was recommended by Heithersay (2004) to completely remove the granulation tissue present in the lesion, which reduces the risk of ICR recurrence. However, the use of ultrasonic instruments along with the surgical microscope may eliminate the need for trichloroacetic acid, as it can reach small areas without removing a significant amount of tooth structure and safely debrides lesions (Rotondi et al., 2020). Moreover, the acid is very aggressive and can cause burns (Glogau & Matarasso, 1995). Several authors have successfully avoided the use of this substance, as in the present case (Asgary & Fazlyab, 2015; Bal et al., 2015; Krishnan et al., 2015).

Agitation of the auxiliary substance with ultrasonic has been reported to enhance disinfection (Shemesh et al., 2017). In most cases, it was used in combination with additional instruments for treatment, including XP-endo Finisher, (FKG Dentaire, La Chaux-de-Fonds, Switzerland), which was used to whip the canal walls in the reported case (Wigler et al., 2017 and Uygun et al., 2016).

A crucial step in the search for treatment success was the use of intracanal drugs based on calcium hydroxide. This substance has good properties reported in the literature, with an inhibitory effect on root resorption (Doyon et al., 2005; Umer et al., 2013). It also increases the tissue dissolution capacity of sodium hypochlorite (Mohammadi & Dummer, 2011). Shemesh et al (2017) used calcium hydroxide in their 4 reported cases with the aim of necrosing and dissolving the resorption tissue. The same was observed in the present case, which showed the absence of fistulas and granulation tissue in the cervical area after 10 days. To seal and repair these canals affected by this pathology, a single class of materials has the desirable properties for this purpose, bioceramics, among which MTA is the most commonly used material and its results are the best scientifically proven (Ford et al 1996; Torabinejad & Parirokh, 2010).

According to the manufacturer (Angelus, Londrina - PR), Bio-C Sealer is a ready-to-use bioceramic sealing cement indicated for filling root canals. In a case study, recomposition of the periodontium by new bone formation was observed after 2 years of storage (Bento & Jardim, 2019), and another study noted high antimicrobial activity, which is not only alkaline and releases calcium hydroxide, but also reduces reinfection by bacteria (Barbosa et al. 2020).

Another bioceramic cement is Bio-C Repair (Angelus, Londrina - PR), which has multiple indications, including treatment of internal root resorption, and has a major advantage in ease of placement in the resorptive cavity. According to the manufacturer, it has superior properties that promote biomineralization and enable rapid tissue regeneration and also prevent bacterial infiltration. Bio-C Repair demonstrated excellent cytocompatibility when compared to Biodentine and ProRoot MTA (Ghilotti, 2020). When comparing Bio-C Repair with Bio-C Sealer, López-García et al. (2019) showed increased cell proliferation favoring repair.

Regarding post-therapy follow-up, some studies with case reports have published different time intervals in the literature. Schwartz et al. (2010) reported 3 cases in their study with a period of 3, 4, and 9 years after treatment. Other studies followed for 3 years (Umer et al., 2013; Shemesh et al., 2017). However, much of the literature reports a shorter follow-up period after therapy. Park & Lee (2008) had an interval of 27 months. Yilmaz et al (2010) an interval of 1 year. Salzano & Tirone (2015) performed a follow-up after 18 months. In all the above studies, clinical and radiographic examination showed the absence of symptoms and progression of the ICR lesion, with a normal radiographic appearance without new areas of resorption.

In the present case, the post therapeutic follow-up was performed after 10 months, obtaining similar results to those reported in the literature, with additional bone formation in the middle third, in addition to the good adaptation of the material in the cervical area.

4. Final Considerations

By studying the reported case and the studies found in the literature, it is possible to reach some conclusions, including the very aggressive and invasive form of ICR that acts silently, regarding the need for early diagnosis to achieve therapeutic success. A good ally is periapical radiography, which, regardless of its limitations, is generally responsible for the initial findings. Besides, the CBCT is essential for the classification and the development of a better treatment plan that removes all the resorptive tissue and restores the form and function of this dental unit. Another important factor is the therapeutic success achieved by combining the surgical microscope and ultrasonic in both the removal of the resorptive tissue. Finally, the use of calcium hydroxide as an intracanal drug that inhibits resorption and bioceramic cement to repair the tissue and seal the root canal is very important for the success of the treatment.

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