Clinical Management of a First Upper Molar with Invasive Cervical Resorption and Irreversible Inflammatory Pulpitis.

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INTRODUCTION

External cervical tooth resorption is characterized by an irreversible loss of dentin tissue due to the action of odontoclasts (Patel et al 2007). It may also be called invasive cervical resorption (ICR). It is an inflammation of the tissues supporting the tooth. Initially, there is no pulp involvement (Mavridou AM, Pyka G, Kerckhofs G, et al 2016). Generally, this type of resorption begins immediately below the union epithelium in the cervical region of the tooth. While there is no bacterial invasion in the pulp cavity, the pulp's vitality is maintained. Thus, the pre-dentin layer will be present. The ICR does not progresses into the pulp cavity possibly due to the presence of inhibitory factors in this pre-dentin layer (Wedenberg 1987, Mavridou et al. 2016, Mavridou AM, Pyka G, Kerckhofs G, et al 2016). Its diagnosis and treatment are not always easy and the prognosis depends on the location and degree of severity of the lesion when diagnosed.

Several etiological factors may be involved in ICR. These include the following:

- Physical: dental trauma, surgical procedures, orthodontic movements, periodontal scaling and bruxism (Heithersay 1999).

- - Chemical: internal bleaching agents, especially in cases of heating and high concentrations of hydrogen peroxide (Harrington & Natkin 1979, Cvek & Lindvall 1985, Schroeder & Scherle 1988, Gold & Hasselgren 1992, Neuvald and Consolaro 2000).

- Anatomical variation: the type of cementoenamel junction seems to play a key role in external cervical resorption. In 10% of teeth, there is no juxtaposition of the sealing to the enamel (Schroeder & Scherle 1988). Thus, an area of the dentin has no sealing or enamel (Cvek & Lindvall 1985, Neuvald and Consolaro 2000). This dentin exposure is a risk factor for the development of ICR (Neuvald and Consolaro 2000).

In cases where the cementoenamel junction is not continuous, physical and/or chemical irritants can cause damage to the bone and dentin. This aggression may lead to biochemical changes in the affected tissues, leading to the formation of multinucleated giant cells. These cells are clastic cells. In these clinical situations, they may act by reabsorbing the dentin. In the resorption process, monocytes and macrogens are present, as well as complex enzymatic and hormonal events.

Cervical reabsorption begins on the outer surface of the root and progresses toward the pulp. However, when it still presents vitality, the pre-dentin layer is maintained and the ICR does not invade the pulp cavity. Predentin, which is a non-mineralized tissue, changes the direction of resorption progression by making it settle circumferentially to the pulp cavity (FIGURE 4, FIGURE 5, FIGURE 6, FIGURE 7).

The diagnosis of ICR can be performed by clinical examination when it is in a more advanced stage, allowing its direct visualization. Clinically, at the beginning of the process, the tooth condition is asymptomatic since no pulp pathophysiological

changes are involved. In these cases, diagnosis by image is the most effective method. For this reason, direct visual clinical diagnosis is not possible in the early stages. Imaging examinations such as periapical radiographs and/or CT scans are efficient methods of diagnosis. Among these, the conical beam tomography is more accurate than the periapical radiography (Patel et al 2016, Vaz de Souza D et al 2017).

The treatment of ICRs aims to protect the affected dentin from exposure to the patient's immune system. For this, cleaning the affected area and restoring the cavity with biocompatible material is the indicated treatment. As these areas are in direct contact with tissue and salivary fluids, they are wet and irregular due to the destructive aspect of the resorption process. Therefore, the material of choice for the closure of this cavity, besides being biocompatible, must be able to fill irregular cavities and have good physicochemical behavior in a wet environment.

Throughout the history of dentistry, several materials such as resins, amalgam, resin-modified glass ionomer, hydroxyapatite and endodontic sealers were used for this purpose. However, none of these presented desirable characteristics and results. Only bioceramic materials have the desirable characteristics for this purpose. Among bioceramic materials, MTA is the most used material and has the highest scientific evidence of its results (Pitt Ford et al 1996, Torabinejad & Parirokh M 2010, Parirokh M & Torabinejad 2010).

CASO CLÍNICO

A 52-year-old female patient, ASA I, came to the clinic with complaints of spontaneous pain exacerbated by hot and cold foods in the right maxilla. On clinical examination, tooth 16 responded to thermal tests with high-intensity, pulsating pain and taking long to cease. She did not present positive responses to lateral and vertical percussion tests, nor to apical palpation. The clinical diagnosis was symptomatic irreversible pulpitis with normal periapex. In addition, a radiolucent image was visualized on the radiographic examination involving the cervical and coronary region of tooth 16, leading to the suspicion of a Cervical Invasive Resorption (FIGURE 1, FIGURE 2, FIGURE 3). In order to have a confirmation of the diagnosis and assess the extent of the lesion, a concomitant computed tomography scan was performed.

In the tomography, we could observe the three-dimensional extension of the ICR around the pulp cavity. As previously described, the ICR does not invade the pulp cavity when the pulp is alive due to the presence of the pre-dentin layer. This imaging characteristic is present in cases of external dental resorption where the pulp is still alive with consequent preservation of the pre-dentin non-mineralized layer (FIGURE 4, FIGURE 5, FIGURE 6, FIGURE 7).

The endodontic treatment was performed according to the pulpal diagnosis. However, a complementary approach was required in the resorption area (FIGURE 8). The marked curvature of the mesial root led to the selection of a reciprocating nickel - titanium instrument with shape memory control (Reciproc Blue - VDW) for mechanical preparation.

After accessing the pulp chamber, 5 ml of sodium hypochlorite were used for initial irrigation (FIGURE 9). Afterwards, a Reciproc Blue 25 instrument was progressively introduced into each of the canals, in cycles of 3 slight incoming and outgoing movements in the canals followed by irrigation of 3 ml Hypochlorite between each cycle, until they reached 2/3 of the radiographic length of the tooth. At this time, the actual working length was established using an electronic foraminal locator. Subsequently, the Reciproc Blue 25 instrument was taken to the working length. With a Reciproc Blue 40 instrument, the diameter of the apical preparations was increased (FIGURE 10, FIGURE 11). Due to the shape memory control of the Reciproc Blue files, it was possible to perform the apical preparation of the mesiobuccal root with marked curvature, even with an instrument of 40 apical diameter and 5% taper.

The irrigation protocol of 3 ml of solution per canal at every 3 incoming and outgoing movements of the reciprocating instrument was maintained until the end of the preparation. After finishing the chemical/mechanical preparation of the canals, the irrigation was performed with 17% EDTA associated to passive ultrasonic irrigation in 3 cycles of 20 seconds per cycle in each canal. The canals were then re-irrigated with 2.5% Sodium Hypochlorite.

For endodontic filling by the cold vertical compaction technique, MTA Fillapex (Angelus - Londrina, Brazil) and pre-calibrated gutta-percha cones were selected.

In the resorption region, an intra-coronary (non-surgical) sealing approach was chosen. This choice was made due to the small extent of the area of communication between the resorption and the external dental surface (FIGURE 9). For sealing the resorption area including the communication between the external/

internal surface, the material of choice was MTA-HP and not the conventional MTA. As the conventional MTA contains Bismuth Oxide as radiopacifier, it may lead to a darkening of the tooth crown when used near the cervical region or in the dental crown. Bismuth Oxide may react with the dentin collagen, causing a graying of the dental structure (Marciano MA et al 2014). This color alteration may also occur due to the interaction between Bismuth Oxide and Sodium Hypochlorite (Camilleri et al 2014, Marciano MA et al 2015). Thus, using bioceramic materials containing Bismuth Oxide as a radiopacifier should be avoided.

With the concern for preserving the aesthetics of the clinical cases treated with bioceramic materials, new formulations of these materials have been proposed by the industry. As an example, MTA HP Angelus has Calcium Tungstate as radiopacifier. This new formulation does not lead to chromatic changes in dental structure (Marciano Ma et al 2014). Thus, HP MTA can be used in areas close to the tooth crown without the chromatic impairment of the treated tooth. Furthermore, the addition of an organic plasticizer to the liquid component of this new material significantly improved its clinical management. As this clinical case involves the placement of bioceramic material near the coronary cervical area of tooth 16, we chose MTA HP to preserve the original color of the tooth (FIGURE 12). In the 8-month clinical control it is possible to observe the maintenance of the original color of tooth 16 (FIGURE 13) as well as the normality of the periapical tissues (FIGURE 14, FIGURE 15).

CONCLUSION

Invasive cervical resorptions are pathologies of immunological character. When early diagnosed, where the extent of tooth destruction is still small and easily accessible, the prognosis is favorable. Bioceramic repair materials are indicated to seal the communication between the endodontium and the external surface of the root. As invasive cervical resorptions involve aesthetic areas, bioceramic materials containing Bismuth Oxide should be avoided because they cause chromatic changes in the crown of the impaired tooth. Therefore, traditional MTAs are not indicated in these cases. However, new formulations of MTA such as MTA HP do not contain Bismuth Oxide. This characteristic does not lead to changes in tooth color. Hence, this is the most suitable material for sealing these areas of resorption.

LEGENDAS

FIGURE 1- Initial periapical radiograph.

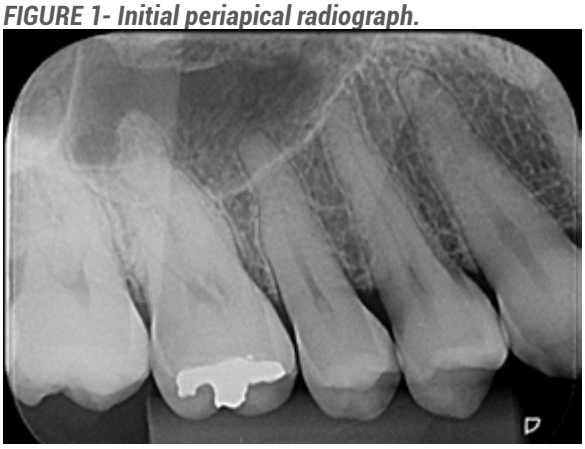


FIGURE 2- Initial periapical radiograph at different horizontal angulation.

FIGURE 3- Interproximal radiograph

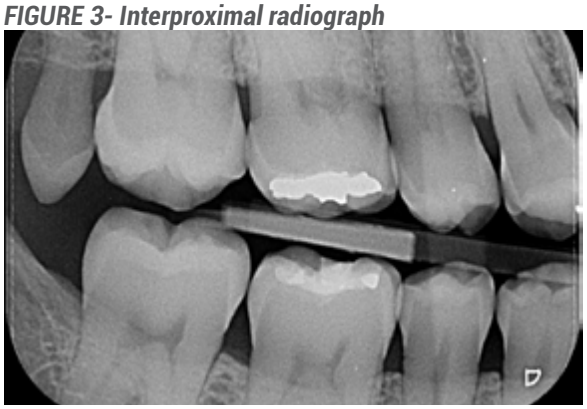


FIGURE 4- Computed tomography showing the shape of the resorption around the pulp chamber

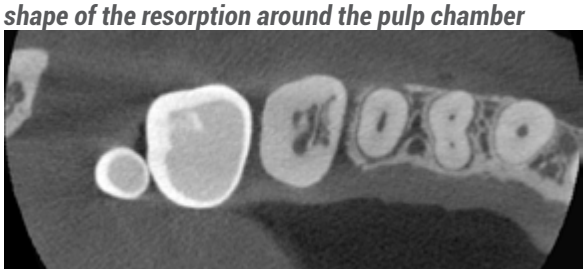


FIGURE 5- Computed tomography showing the Invasive Cervical Resorption.

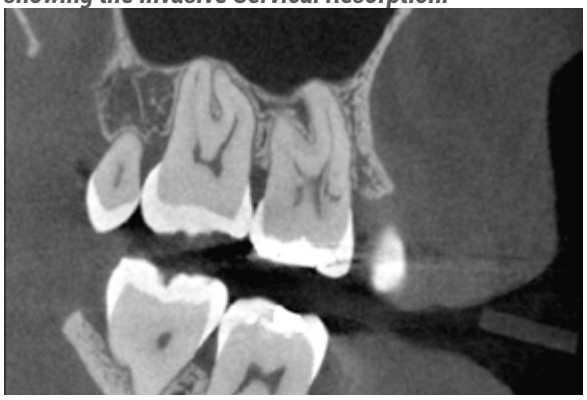


FIGURE 6- Invasive Cervical Resorption around the pulp chamber.

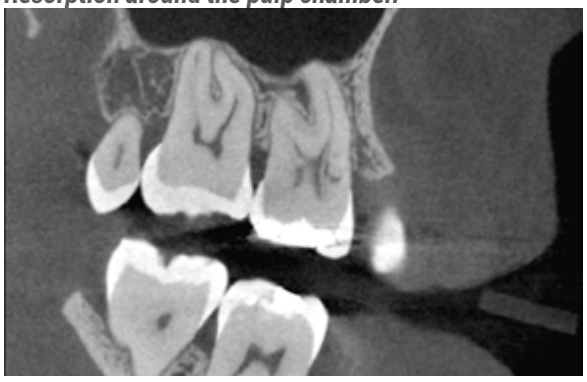


FIGURE 7- ICR Area and Location.

FIGURE 8- Live pulp.

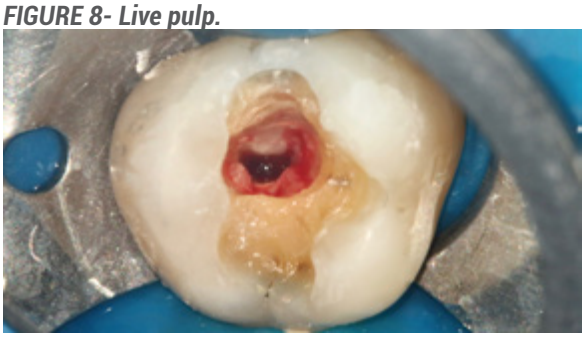


FIGURE 9- Connective tissue filling the area of resorption.

FIGURE 10- Location of mesiobuccal canal 2.

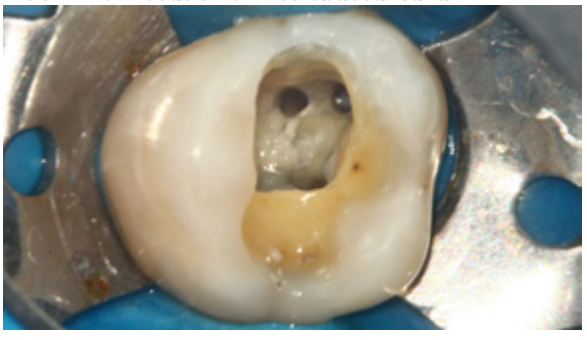


FIGURE 11- Root channels prepared with Reciproc Blue 40

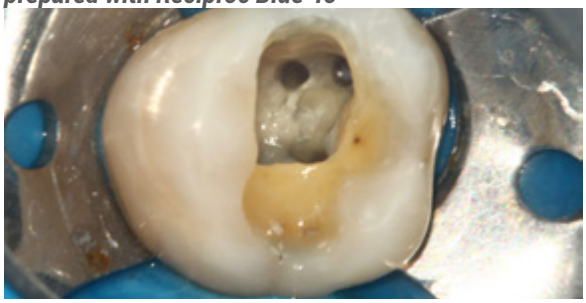


FIGURE 12- Final radiograph.

FIGURE 13- Clinical aspect 8 months later - color preservation.

FIGURE 14- Control periapical radiograph (8 months later).

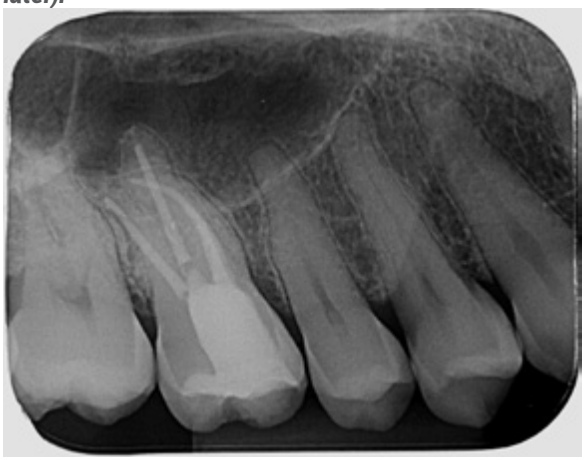
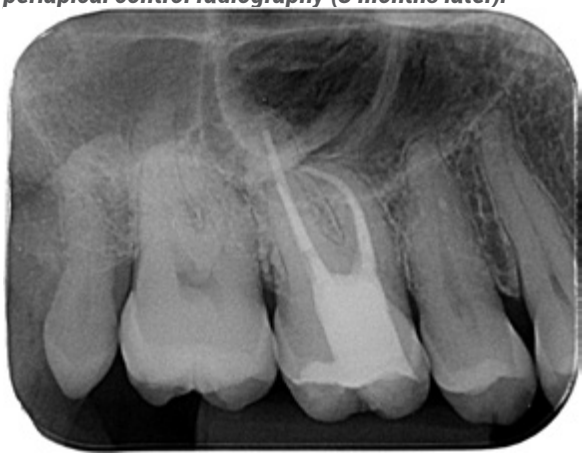


FIGURE 15- Horizontal angulation variation of the periapical control radiography (8 months later).



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