

Internal Inflammatory Root Resorption. Management with Mineral Trioxide Aggregate and Gutta-Percha

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Abstract

Early diagnosis and accurate treatment are essential for Internal Inflammatory Root Resorption (IIRR) control. The aim is to present the sequence of diagnosis, treatment and follow-up of an IIRR using gutta-percha (GP) and Mineral Trioxide Aggregate (MTA) as obturation materials. This study exhibits an IIRR case in the #9 tooth of a 64-year old patient. History refers to a horse's kick suffered ten years earlier. The tooth was asymptomatic during the interim time period but eventually the patient experienced symptomology. Following a detailed exam, a treatment plan was reached to save the tooth and maintain its functionality.

Keywords: Inflammatory Internal Root Resorption; Mineral Trioxide Aggregate; Gutta-Percha; Endodontics

Introduction

Internal dental resorptions are relatively rare condition [1]. They can be detected with radiographs if of sufficient size but are mostly asymptomatic and are subject to progressively exhibiting chronic inflammation, unless the pulp is non-vital [2,3]. According to the Glossary of Endodontic terms as published by the American Association of Endodontists, internal resorption is an inflammatory process initiated within the pulp space with loss of dentin and possible invasion of the cementum [4]. It is accepted that radiographs provide limited information due to two-dimensional imaging, therefore it is recommended that various different angles be taken, permitting observation any alterations from the original canal anatomy. However, the use of CBCT [5] provides a much higher quality imagery; three-dimensional and a higher resolution allowing for a better diagnosis. Patel *et al.* in their study, recommend the superior quality achieved by the use of CBCT as compared with the intraoral X-rays [6], because the overall sensitivity of intraoral radiography was lower than CBCT. The ROC (receiver operating characteristic) analysis revealed that intraoral radiography had a lower median Az value (0.780) than CBCT (1.000) for diagnosing internal resorption ($P = 0.027$).

Dependent upon the location of the pathology, clinically "pink spots" may occasionally be observed in the area of the crown due to the high vascularization present in the tissue and the high resorptive activity within the root canal [7-9]. Ebeleseder *et al.* reported cases wherein IIRR diagnoses and treatment did not have pink spots [10]. Sinus tracts might be detected clinically, which might be indicative of root perforation or chronic apical abscess [11].

While the etiology of IIRR is not completely clear studies have shown that trauma is the principle factor responsible followed by inflammation/infection of the pulp area. Some authors believes that bacterial colonization of the dentin has a fundamental role in the development of the resorption [8,12]. The prognosis for the management of small lesions of IIRR is very good [1].

After considering a differential diagnosis, including external root resorption, the challenge is in eliminating the inflamed tissue in order to prevent advancement of the resorptive process [13]. Nevertheless, it is important to accept limitations in our ability to disinfect and eliminate etiological agents and resorptive tissue, so as to create a healthy environment for a positive response of the tissue area [14].

For obturation of the canal, materials chosen should contain good sealing characteristics, good compressive strength, and be biocompatible. MTA is the material of choice for these cases and is also used for the repair of perforations, dental pulp protection, root-end barrier in teeth with an open apex and root-end filling material [4]. Torabinejad *et al.* [15] reported that MTA has no antimicrobial effect on either facultative or anaerobic bacteria, other than to maximize the action mechanism associated with its sealing capacity. The following clinical case presents the management and follow-up of an anterior tooth with a ten-year trauma history.

Case Report

A 64-year old male patient was admitted to the dental office presenting symptoms of swelling and pain in tooth #9. The patient related that ten years earlier he had been kicked by a horse but had not felt any dental discomfort.

A clinical exam was completed on the first visit; edema was observed in the area along with abscess of the marginal gingiva. Patient was previously anesthetized (Totalcaina Forte L-adrenalina 1:100.000, Laboratorios Bernabo Bs.As., Argentina), drainage incision was made on attached gingiva close to the tooth, and purulent exudation was observed (Figure 1). Upon examination of the radiographs, an oval-shaped radiolucent zone was observed that altered the original morphology of the radicular canal (Figure 2).



Figure 1



Figure 2

Once drainage was concluded, the tooth was isolated with rubber dam (Hygienic, Coltene/whaledent GmbH, Germany) and #9 clamp (Hu-Friedy, USA). Conservative endodontic access was completed (note purulent exudation from the cavity) (Figure 3). Intracanal irrigation with sodium hypochlorite 5.25% was completed followed by instrumentation of the canal with rotary system using a F3 file ProTaper Universal (Dentsply Sirona, PA, USA) to working length of 21 mm. The canal was irrigated with sodium hypochlorite 5.25%, applying activations with ultrasonic tips (Multipiezo, Mectron s.p.a., Carasco GE, Italy). This process was repeated five times until the exudation ceased and the canal was clean.

Then, another irrigation was completed for five minutes with 5 ml of EDTA 17% (Farmacia Once, Bs.As., Argentina), and 5 ml of chlorhexidine 2% (Farmacia Once, Bs.As., Argentina) for an additional five minutes. The canal was dried with sterile paper points (ProTaper Universal Absorbent Points Size F3 Blue, Dentsply Sirona, PA, USA) and subsequently obturated using a paste from calcium hydroxide (Dickinson, Lab. Dr Preston, Bs.As., Argentina) and chlorhexidine 2% (Farmacia Once, Bs.As., Argentina) for seven days.



Figure 3

On the second visit, the patient was anesthetized (Totalcaina Forte L-adrenalina 1:100.000, Laboratorios Bernabo Bs.As., Argentina), and rubber dam (Hygienic, Coltene/whaledent GmbH, Germany) was put in place. Temporary filling was removed and the root canal irrigated with 5ml. of sodium hypochlorite 5.25%. Ultrasonic tips were used until assured no tissue remnants, calcium hydroxide or blood was present. Irrigation was completed with EDTA 17% and chlorhexidine 2%.

For obturation, the canal filling was prepared according to manufacturer's instructions using MTA Plus (Prevest DenPro Limited, India). MTA was compacted using Machtou Hand Pluggers 1-2 (VDW GmbH, Munich, Germany) until reaching an apical plug of 4 mm. Filling the canal spaces continued with MTA (Figure 4).



Figure 4

In the space remaining prior to compaction completion a gutta-percha point size M (Hygienic, Coltene/Whaledent GmbH, Germany) with endodontic sealer (Roeko Seal Automix, Coltene/Whaledent GmbH, Germany) was placed. A radiograph was taken to assure that the area and cone "surpassed" the reabsorption zone (green arrow). The gutta-percha will serve as a "guide" in the desobturation process within the cavity in the event that in the future a post would be needed (Figure 5).



Figure 5

Finally, coronal access was filled with Filtek Z350 XT (3M ESPE, St. Paul, MN, USA) composite and immediately after the procedure, a radiograph was taken. Note the filling material's overextension (MTA) in the apical zone (Figure 6).

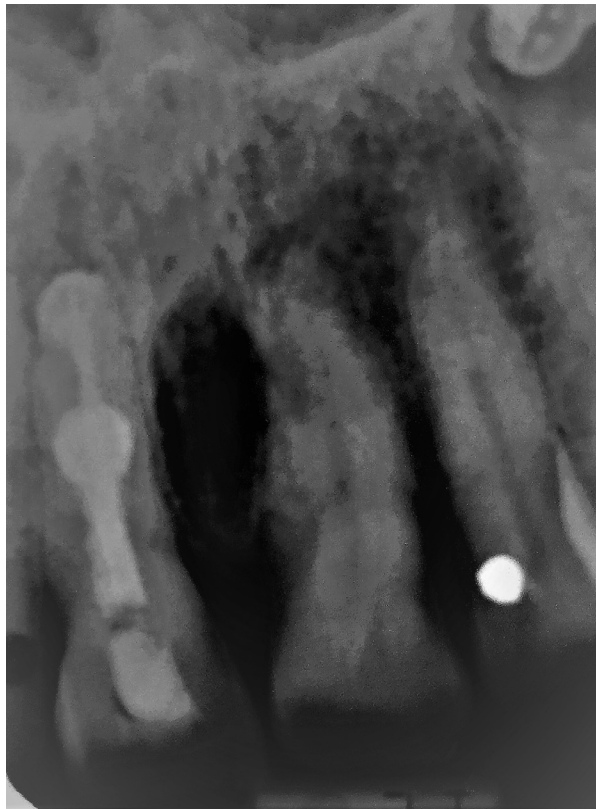


Figure 6

After one year, the tooth was symptom free and radiograph was taken showing healing in the surrounding tissues. Clinical examination showed evidence of healing process, both in the palate and cheek areas (Figure 7).



Figure 7

Discussion

Early diagnosis and prompt treatment is recommended for IIRR. Detection of this type of resorption is often accidental since the majority present themselves asymptomatic and is only detected through routine treatment by radiographs or CBCT scans. Clinical signs may vary according to the location of the IIRR and its wideness [16]. The diagnostic challenge with internal root resorption is external cervical resorption when it projects over the root canal on a radiograph [1]. CBCT has advantages over other methods when used in diagnosis and follow-up healing [5]. This article's example case is directly related to a traumatic injury and posterior pulpal infection.

The prognosis for an IIRR is affected by the health status of the dental pulp, location, extension, number of surfaces involved and other factors. Predisposing factors as trauma, pulpitis, cracked tooth, tooth transplantation, restorative procedures, invagination, and orthodontic treatment are suggested [1]. The responsible cells for the dentinal resorption would be the odontoclasts. Multinucleated giant cells (osteoclasts) are derived from the hematopoietic precursors. Similarities were found between multinucleated cells responsible for osseous resorption (osteoclasts) and the cells responsible for the dental resorption (odontoclasts) [17]. While they are the same cell, odontoclasts are smaller, have a ruffled border, contain fewer nuclei than osteoclasts, and have smaller or no clear zone [18]. In experimental studies, amounts of RANKL (Receptor Activator of Nuclear Factor κ B Ligand) expression were found in cytoplasm and membrane [19]. It is believed that RANKL intervenes in differentiation and modulation of the cellular phenotype, thereby contributing to the resorption activity.

If IIRR is advanced, it could debilitate the structure and resistance of the tooth, even perforation can occur. An access cavity conservative and minimal invasion is recommended, but it should permit the use of the irrigation systems and instruments without obstacles. Ultrasonics devices and irrigants can help in the elimination of bacteria and tissue from within the canal. Though there is no guarantee of total and complete disinfection, the use of the ultrasonic tips provides maximum help in eliminating bacteria and tissue [22]. Ultrasonics tips should be used carefully, avoiding producing cavitations. Sodium hypochlorite used as irrigant, must reach all spaces, irregularities, defects and concavities of the canal in order to insure elimination of biofilms and necrotic tissue [20,21]. The arresting of the IIRR is achieved when the canal is disinfected and remains of tissues are eliminated including odontoblastic cells, as these cells need a blood supply for continued activity and survival [8,20]. Calcium hydroxide has been recommended for use as intracanal medication in teeth with necrotic pulp and contaminated canals. The calcium hydroxide was used between sessions as intracanal medication with quite successful antibacterial results, thereby diminishing the bleeding and infection [23]. Calcium hydroxide has many biological properties like antibacterial effect, dissolving necrotic tissues and inhibitor of clastics cells, therefore root resorption, and hard tissue formation [24].

In regarding to obturation of root canal and defect, MTA appears to be the best option due to its sealing, radiopacity, antibacterial properties and performance, but adverse characteristics like high cost, handling, long setting time and potential discolorations [25]. MTA materials are derived from Portland cement, but aren't the same materials. MTA have a smaller mean particle size, contain less heavy metals, have a longer working time and has purification process, compared with Portland cement [26]. Has been demonstrated the benefits of MTA such as reparation of perforations, good tolerance by the peri-radicular tissue and its sealant properties, also allows the use of hybrid techniques with GP. MTA and gutta-percha can be suggested for use in clinical practice, in cases of internal root resorption cavity obturation [27]. There have been cases reported where the canal was filled with GP thermoplastic with acceptable results, due to the flow characteristics of the material when it is heated [11,16,28]. Historically, gutta-percha has proven to be the material of choice for successful fillin of root canals from their coronal to apical extent [29], also has antibacterial activity due to the zinc oxide in its formula [30].

Conclusion

Early detection, diagnosis, and arrest is considered essential in the prognosis and treatment of the IIRR. The significant advantages of CBCT in diagnosis indicate that its use should be considered. A conscious treatment must be done since we cannot ensure the total elimination of tissues and etiologic factors from the canal systems. The use of intracanal medication like calcium hydroxide, irrigants and MTA as material of obturation, also should be contemplated for a good prognosis. Hybrid techniques with MTA and GP should be the chosen option if posts are to be considered in the future; the process of removing the obturation material from the root canal for a post space, is then easier and comfortable.

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