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Research Article

Invasive Cervical Resorption of a Mandibular Molar Managed with Vital Pulp Therapy: Exemplar Case Study

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Abstract

This exemplar case highlights the importance of conservative treatment to protect the pulpal health of an invasive cervical resorption of a mandibular molar tooth with pulpal exposure. The resorptive site was explored and trichloroacetic acid (TCA) was placed on the localized defect. Following curettage of the resorptive tissue, a small pulp exposure occurred. Direct pulp capping with Dycal, a calcium hydroxide-based material, was used, and the molar was restored with glass ionomer cement. At the 18-month review, the molar tooth demonstrated both clinical (positive pulpal response) and radiographic (absence of any periapical radiolucency) success.

Clinical relevance

Direct pulp capping with calcium hydroxide cement is an inexpensive, conservative, and easy treatment option for pulpal exposure during the management of a Class 2 invasive cervical resorption case.

Objective

To demonstrate the importance of preserving the pulp in the management of a Class 2 invasive cervical resorption lesion.

Introduction

Invasive cervical resorption may occur in any tooth in the permanent dentition and is characterized by its cervical location [1]. It is an aggressive form of external root resorption [2] and is often misdiagnosed as a form of internal resorption [3]. The pulp tissue, however, plays no role in invasive cervical root resorption and is usually normal in these cases. The aetiology of this type of resorption is poorly understood, but the dental literature reports that external resorption is known to be a pathological process, initiated by specific clastic cells that remove the organic and mineral components of dental hard tissues [2]. For this resorptive process to occur, there must be an unprotected, locally destroyed or altered root surface that has become susceptible to clastic cells [4]. It has been postulated that bacteria in the gingival sulcus stimulate and sustain an inflammatory response in the periodontium at the attachment level of the root [5]. Several potential predisposing factors have been identified to have a strong association with invasive cervical root resorption, such as intra-coronal bleaching, dental trauma, and orthodontic treatment, either alone or in combination [6]. A clinical classification of invasive cervical resorption proposed by Heithersay [7] can be used for both research purposes and as a guide in the clinical assessment of these invasive lesions [3] as shown in Figure 1 (adapted from Heithersay [1]). The classification has four categories:

1. **Class 1:** A small invasive resorptive lesion near the cervical area with shallow dentine penetration;
2. **Class 2:** A well-defined invasive resorptive lesion that penetrates close to the coronal pulp chamber but shows little or no extension into the root dentine;
3. **Class 3:** Deeper invasion of dentine by resorptive tissue involving not only the coronal dentine but also extending into the coronal third of the root, and
4. **Class 4:** A large invasive resorptive process that has extended beyond the coronal third of the root.

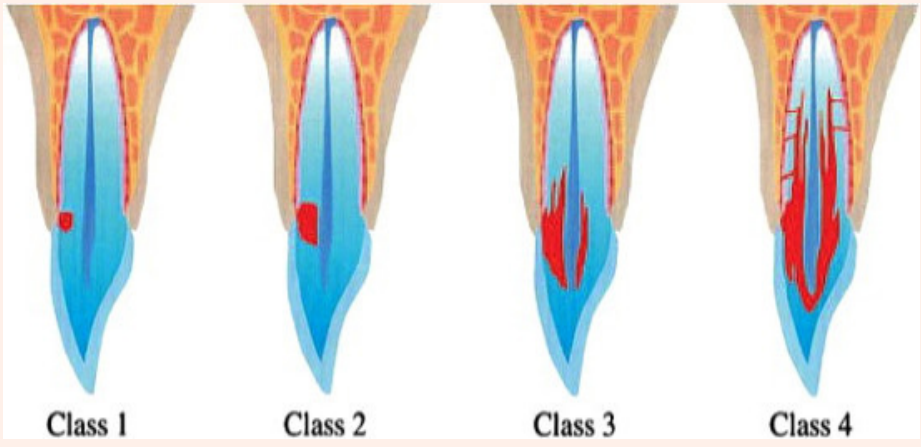

Figure 1: Heithersay's Clinical classification of invasive cervical resorption (Heithersay 1999).

A new 3-dimensional classification was proposed by Patel et al [8]. for use when cone beam computed tomography (CBCT) imaging is used for assessment. CBCT provides more accurate information regarding the exact location, circumferential spread, size and extent, and proximity to the root canal system [9]. If all the necessary information can be obtained with the standard periapical and bitewing radiographs, electrical and thermal pulp testing, and clinical examination, the use of CBCT may not always be necessary. CBCT should be considered, however, where there are uncertainties regarding treatment options or assessing the amount of natural tooth structure remaining for a predictable restoration [10].

In most cases, cervical resorptions are detected during routine radiographic or clinical examination and are usually asymptomatic, unless pulpal or periodontal infection is involved [1]. If the pulp is exposed during removal of the granulation tissue when managing the invasive cervical lesion, a pulpectomy is usually performed but there are certain cases where the clinician may choose to preserve the vitality of the tooth and consider vital pulp therapy instead. Vital pulp therapy in the form of direct pulp capping is an option for maintaining the pulpal health of permanent teeth [11]. Hørsted et al. [12] showed no statistically significant difference in clinical success between cappings of mechanically exposed pulp or teeth with caries exposure. For many years, calcium hydroxide compounds have been the material of choice for direct pulp capping procedures [13]. Olsson et al. [14] conducted a systematic review to evaluate the evidence on the formation of a hard tissue barrier after pulp capping in humans and found that calcium hydroxide-based materials most consistently form a hard tissue barrier. Critical to the preservation of pulpal health after capping should be the integrity of the wound site and whether it can be protected from bacterial invasion [15]. The end product of calcium hydroxide mediated hard tissue repair is thought to provide such a protective role to guard the pulp against bacterial ingress [16]. This case reports a conservative treatment of a mandibular molar tooth to protect the pulpal health of a Class 2 invasive cervical resorption with a direct pulp cap.

Case Report

A 66-year-old patient was referred for management of their lower right first molar (LR6). The patient's dentist had been monitoring for any changes in the pulpal health and lesion size following a bitewing radiograph which had earlier revealed a small radiolucent area located in the mid coronal area of tooth LR6, as shown in Figure 2. The radiolucency was not considered to be caries related, and the patient was not experiencing any dental pain or discomfort from this tooth. However, the patient was referred to the specialist endodontist after a significant increase was noticed in the size and extent of the radiolucency in the mid coronal area of tooth LR6, as shown in Figure 3. The periapical radiograph revealed no periapical infection around the tooth or any furcal or angular bone loss, as shown in Figure 4. The patient reported no history of previous dental trauma, tooth bleaching, or any restorative procedures performed on this molar tooth, and they did not recall any signs or symptoms of problems related to this tooth in the past.

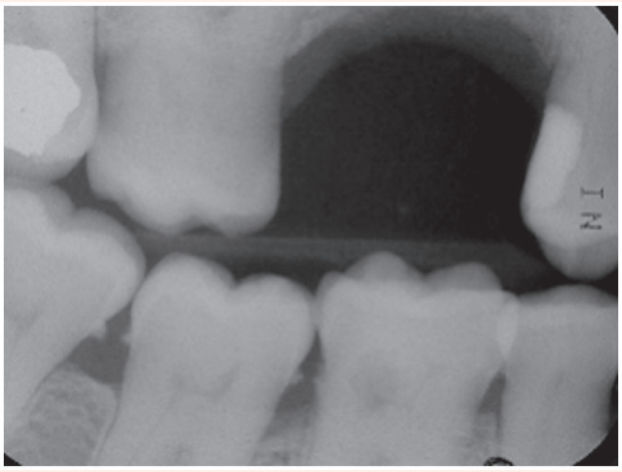

Figure 2: Earlier bitewing radiograph from the referring dentist.

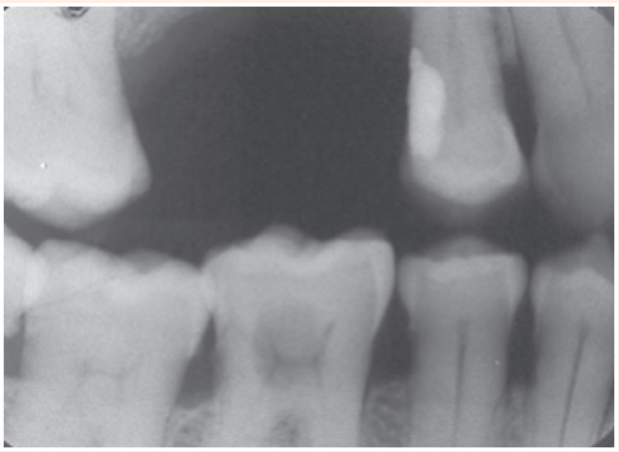

Figure 3: Pre-operative bitewing radiograph.

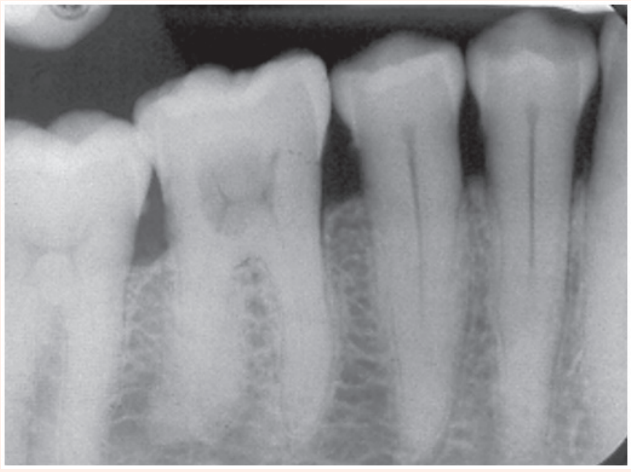

Figure 4: Pre-operative periapical radiograph.

Figure 5: Pre-operative photograph of LR6.

Clinically, the tooth was completely asymptomatic and there was no other pathosis detected for tooth LR6. Probing of the gingival sulcus revealed an apparently normal status on the buccal aspect and on the lingual wall. No cavitation of the overlying enamel was detected subgingival on the buccal or lingual aspect, as shown in Figure 5. Probing resulted in profuse bleeding, indicating the presence of inflamed tissue rather than normal attachment. Pulp testing was performed using carbon dioxide snow and an electric pulp tester (SybronEndo Vitality Scanner). A normal response was recorded from both pulp tests for teeth LR5, LR6, and LR7. Since the pulp was therefore not expected to be involved and the outline of the root canal could be distinguished through the resorptive defect, CBCT was unnecessary because the radiographs taken provided sufficient information. After combining radiographic and clinical findings, the provisional diagnosis of a Class 2 invasive cervical resorption associated with the healthy pulp of tooth LR6 was made.

Management was initiated under rubber dam isolation using a cuff technique, with strict adherence to moisture control and avoidance of saliva contact with the exposed pulpal tissue. Vaseline was placed over the gingival tissues and the rubber dam surface, followed by an oral seal base for protection and isolation of the area, as shown in Figure 6. Lingual access with a high-speed bur under water spray was followed by the application of trichloroacetic acid (TCA), on a small cotton pellet, to the resorptive defect with slowly increasing pressure for one minute. Following curettage of the avascular tissue from the resorption cavity, the appearance of more granulation tissue within the resorptive defect indicated further removal until the dentinal base of the cavity was revealed. However, a small pulpal exposure occurred as shown in Figure 7. A small amount of Dycal (L.D. Caulk, Dentsply International Milford, DE, USA) was placed over the exposed pulp and glass-ionomer cement (Fuji IX, GC Corporation, Japan) was placed in the resorptive cavity, as shown in Figure 8.

Figure 6: **Photograph of LR6 investigation under rubber dam isolation.**

Figure 7: Photograph of pulpal exposure.

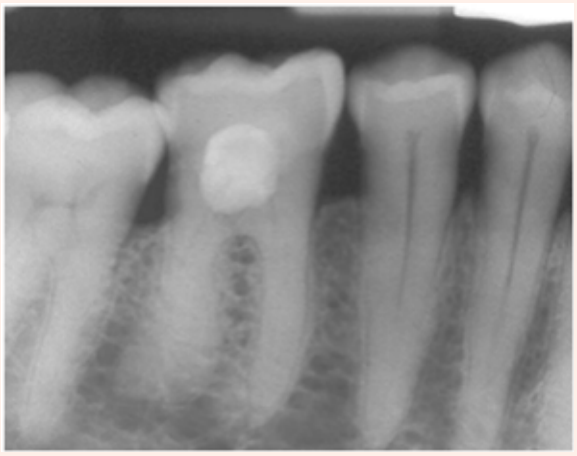

Figure 8: Post-treatment radiograph of LR6.

Follow up

The patient was invited to return 18 months later for review. On review, tooth LR6 was asymptomatic, and the tooth continued to demonstrate both clinical and radiographic success with no evidence of any invasive cervical resorption extending beyond the restorative margins, as shown in Figures 9 & 10.

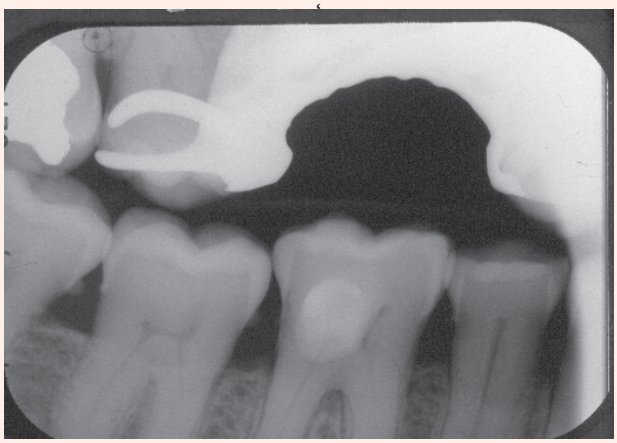

Figure 9: Review bitewing radiograph.

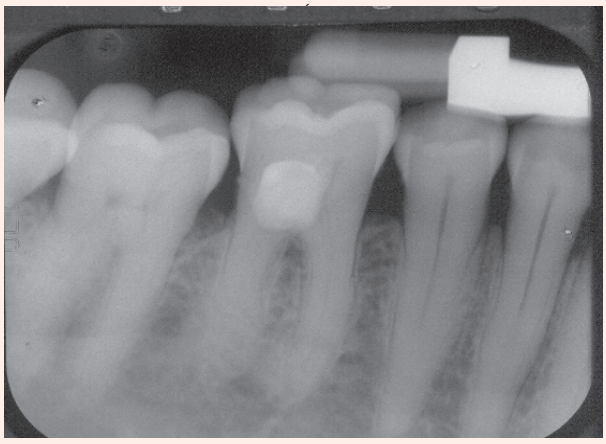

Figure 10: Review periapical radiograph.

Discussion

Invasive cervical resorption is a complex pathologic condition [7] and is characterized by its cervical location and invasive nature. A rational approach to the management of root resorption relies on recognition of the type of resorption and, if required, the application of a therapeutic agent which will control the clastic cells by biological intervention [2]. Radiographically, an internal resorptive will have an enlargement of the root canal outline, while an external resorptive defect displays an intact outline of the root canal [1]. A treatment regime for the management of external invasive cervical root resorptive lesions proposed by Heithersay [7] involves the topical application of a 90% aqueous solution of TCA to the resorptive tissue, curettage, and restoration with glass-ionomer cement. Heithersay's study shows that in Class 2 cases, the success rate of this external approach, judged by the absence of pulpal, periradicular pathosis and resorption, was 100% [7].

The classification of a Class 2 invasive cervical root resorption was made for the tooth in this case based on the findings that the resorptive lesion was deep following removal of the granulation tissue, near the pulp, and that the outline of the lesion were well defined clinically. Since the resorptive defect was located on the lingual surface of tooth LR6 and close to the gingival margin, an external approach was performed. The reason for choosing a non-surgical approach in managing this case was due to concerns that raising a flap and curetting the adjacent tissue may create a periodontal defect in the future. Following curettage of the resorptive cavity, a small pulpal exposure occurred, and an assumption was because of mechanical trauma caused by the clinician following removal of the granulation tissue, rather than the result of the invasive lesion.

According to Heithersay [2], if the dental pulp is involved because of invasive cervical resorption, elective pulpectomy may be considered. However, for this tooth, the small mechanical exposure occurred under rubber dam isolation and no saliva contamination of the site was expected. Thus, direct pulp capping with a calcium hydroxide-based material was the treatment of choice. Direct pulp capping is a legitimate treatment whereby a protective agent is applied to exposed pulp to allow the pulp to maintain its vitality [14]. Essentially, vital pulp therapy can have a high success rate if the following conditions are met [17]:

a) the pulp is not inflamed;

b) haemorrhage is properly controlled;

c) a non-toxic capping material is applied; and

d) the capping material and restoration seal out bacteria.

As noted earlier, calcium-hydroxide based materials have been found to consistently form a hard tissue barrier [14] and hard setting calcium hydroxide pastes e.g., Dycal, have been reported not to necrose the pulpal tissue and are considered less caustic than pure calcium hydroxide [18]. Despite the reported high likelihood of pulpal healing and repair in follow-up studies [12,19], pulp capping of the exposed pulp remains a contentious treatment procedure for adult dentition [20], because the new hard tissue may not always serve as a reliable barrier and may exhibit porosities that can serve as pathways for bacteria to invade the pulp [21]. Although pulp capping has been reported to not have a predictable success rate [22], Adei et al. [23] however, did find no significant difference in tooth survival between teeth treated with Dycal or mineral trioxide aggregate (MTA). In this case, calcium hydroxide hard-setting cement was chosen because it is readily available in general dental clinics, less expensive and a quicker setting time compared to other dental materials on the market, such as MTA or biodentine cement. From the author's viewpoint, it is always better to try and preserve the pulp following a case-by-case assessment. From the patient's perspective, the proposal to take a vital pulp therapy approach was a more acceptable and a less expensive treatment option compared to root canal treatment and a full coronal cast restoration, or tooth extraction followed by further restorative options, such as denture, bridgework, or dental implants. However, this resorptive lesion should be monitored for up to four years [24] to review both the pulpal and periapical health for possible changes that may result in later dental treatment, such as root canal treatment.

Conclusion

In this exemplar case, the invasive cervical resorption was successfully managed with vital pulp therapy. This conservative approach is easy, inexpensive, and relatively simple for any dentist to undertake without involving expensive treatment options for the patient. If there is any suspicion that the resorption is not diagnosed accurately on a periapical radiograph, CBCT should be considered to assist with both diagnosis and treatment planning.

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