CASE REPORT

Treatment of a cervical resorptive defect in a mandibular first premolar: An 18-month follow-up

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Abstract The objective of this report is to describe the multidisciplinary management of a cervical resorptive defect using periodontal surgery, endodontic treatment, mineral trioxide aggregate (MTA) and composite resin filling. The resorptive defect was obturated using MTA following the reflection of a mucoperiosteal flap and conventional root canal treatment was completed. The cervical extension of the MTA-filled cavity, which was evident following the suturing of the flap, was reduced and filled with a composite filling material. No complaints were noted by the patient and at the 18-month follow-up the prognosis was favorable. By appropriate multidisciplinary management, root resorptions may be treated successfully. MTA may serve as a good option in such situations owing to its multi-beneficial properties.

Introduction

Root resorption is a pathological condition characterized by loss of tooth structure by clastic cells.1 The condition can be internal or external, depending on its location of onset. External root resorption is described as a progressive and destructive loss in tooth structure. One of the most challenging forms of external root resorption is...
external cervical resorption, later identified as invasive cervical resorption by Heithersay\(^2\) to emphasize the aggressive nature of the pathological condition. Intracoronal bleaching, dental trauma, orthodontic treatment, periodontal therapy and idiopathic factors have been reported as the major etiological factors that cause invasive cervical resorption. Bruxism, intracoronal restorations, and developmental defects such as hypoplasia or hypomineralization of cementum have also been suggested as predisposing factors. Although the cementum serves as a protective barrier, it may be damaged below the epithelial attachment to expose the root surface to odontoclasts, predisposing this region to external cervical resorption.\(^3\) Highly vascular fibrous tissue with multinucleated osteoclastic cells along the dentin has been reported as the characteristic histological feature of the resorptive defect.\(^4\) Cervical root resorptions may be unnoticed unless there is a pink spot or discoloration detected by the dentist or there is a pulp or periodontal involvement necessitating a dental visit. In asymptomatic cases, they can be detected by a routine radiograph. The involvement of a single tooth is observed in most of the cases with cervical resorption. Sometimes more than a single tooth may be affected, particularly in cases with previous orthodontic treatment.\(^5\) Exposure of the resorptive tissue and restoration of the area with a tooth-colored material is the most effective means of treatment. Glass ionomers, composites, amalgam or mineral trioxide aggregate (MTA) are materials that can be used for closure of the defective area. MTA has specifically gained attention in recent years owing to its multiple beneficial properties, such as good sealing ability, biocompatibility, setting in the presence of moist environment and blood and bactericidal effect.\(^6\)–\(^8\)

When the defect is extensive enough to cause a pulpal perforation, an endodontic treatment is necessary. The following case report describes the interdisciplinary management and 18-month follow-up of a cervical resorptive defect associated with the mandibular right first premolar of a patient with the collaboration of the endodontics, periodontology and operative dentistry departments.

### Case report

A 60-year-old female patient presented to our clinic complaining of pain in the mandibular right region. The dental history of the patient did not disclose any traumatic injury, orthodontic or periodontal treatment. Clinical examination revealed no signs of carious lesions in any of the teeth associated with that area; thus the patient was referred to the periodontology department for a further evaluation.

A periapical radiograph was taken from the mandibular right premolar region and a radiolucency extending towards the pulp of the mandibular first premolar below the cementoenamel junction was observed (Fig. 1A). During periodontal examination and probing, a pocket depth of 6 mm was detected specifically in the mesial aspect of the tooth involved. There was also slight bleeding on probing. No mobility was present. Suspecting that the radiolucency might be an external root resorption, a root canal treatment was followed by explorative surgical intervention was scheduled.

During the endodontic visit, after rubber-dam application, an access cavity was opened using diamond burs and an initial file was inserted in the root canal; however, during initial filing there was considerable bleeding from the root canal due to the granulation tissue that had accumulated in the site of the resorptive lesion. This prevented the accomplishment of a safe root canal treatment; therefore a decision was made to perform the root canal treatment in a future surgical procedure. A premixed calcium hydroxide paste (Pulpdent Tempcanal, Pulpdent Corporation, Watertown, MA, USA) was placed in the root canal and an appointment was scheduled. During the scheduled visit, inferior alveolar block anesthesia was performed using a local anesthetic solution (Maxicaine Fort, VEM Ilac, Ankara, Turkey) and an intrasulcular incision was made from the mesial aspect of the mandibular canine to the distal aspect of the mandibular second premolar. After the reflection of the mucoperiosteal flap, it was noted that the defect was located in the vestibular portion of the root. The granulation tissue in the defective area was carefully curetted using periodontal curettes and root surface was scaled and planed (Hu-Friedy, Chicago, IL, USA). The

![Figure 1](image-url) (A) Radiographic appearance of the external cervical resorption during the initial visit. (B) Radiographic appearance following the obturation of the root canal and the resorptive cavity. (C) Periapical radiograph taken 18 months later showing healthy periapical tissues.
surgical area was cleaned by copious irrigation with sterile saline solution (Fig. 2A). The flap was placed in position and the endodontic procedure was initiated. Following the isolation of the tooth involved with a rubber dam, the root canal was accessed from the previously opened access cavity and enlarged to a master apical file #40 under copious sodium hypochlorite irrigation. The root canal was filled by the lateral compaction technique using AH Plus sealer (Dentsply Konstanz, Germany) and gutta-percha. The root filling material was cut short using a preheated instrument. The flap was re-reflected and a slurry of MTA (Angelus, Londrina, Brazil) was prepared to obturate the resorptive area (Fig. 2B). After MTA placement, the muco-periosteal flap was sutured with nonabsorbable sutures and the patient was scheduled for a restorative procedure. A periapical radiograph was taken to confirm the obturation of the root canal as well as the defect and the access cavity was filled with a temporary filling material (Fig. 1B). Since the defect extended towards the coronal portion as well as the mesial and distal aspects, part of the MTA filling was exposed after suturing. This necessitated the further placement of a composite filling in the cervical portion during the next appointment, which was scheduled for the final restoration.

During the scheduled appointment, the occlusal endodontic access cavity as well as the defect extending towards the coronal region was filled using the AdheSE (Ivoclar Vivadent AG, Principality of Liechtenstein) two-step self-etch adhesive system and Filtek-Z250 (3M ESPE, St Paul, MN, USA) composite filling material. During the restorative procedure, a #1 retraction cord dipped in hemostatic agent was placed in the gingival crevice to prevent the leakage of gingival fluid and blood to the area. The superficial layer of MTA was removed to provide space for the filling material. The coronal enamel portion of the cavity was beveled to increase adhesion. The cavity was thoroughly dried and AdheSE primer was applied for 30 seconds and air dried. Then, AdheSE Bond was applied to the cavity, thinned by air, and light cured for 10 seconds. Filtek-Z250 (3M ESPE, St. Paul, MN, USA) with A3 shade was applied to the cavity and light cured. The restoration was completed by final trimming and polishing. Care was taken not to disrupt the biological width in the aspect of the composite filling during its placement. The marginal portion of the filling was adjusted so that it was within the normal relationship with the alveolar crest. Three months after the completion of the restoration, the patient was recalled and a free gingival graft was placed in order to provide further support to the gingival tissues.

Eighteen-month follow-up showed an uneventful healing period with no complaints from the patient. A control radiograph taken from the area revealed healthy periodontal status (Fig. 1C). There was no indication of a pathological pocket depth during probing. The composite restoration was in a favorable condition with no marginal staining or disruption (Fig. 2C).

Discussion

The etiology of the resorption presented in this case report is unknown, and despite multiple factors being reported that render teeth prone to resorption, the dental history of the patient did not include any of the predisposing factors indicated for the occurrence of this pathological condition. In a case report by Yilmaz et al,8 the etiology of the invasive cervical resorption associated with a maxillary canine has been suspected to be related to the guided tissue regeneration treatment performed 10 years ago. However, no history of such a periodontal intervention has been noted for this particular case. Nevertheless, the general periodontal status that exhibited a generalized loss of supportive bone may be a triggering factor for the development of such a resorptive lesion.

The extent of cervical resorptions located in the buccal or labial aspects of the tooth may be difficult to diagnose via conventional X-rays; thus cone beam computed tomography has been advocated as a means of better interpreting the severity of the resorption.3 The treatment in the present case was undertaken relying on the initial diagnostic periapical radiograph taken during the first visit which showed the extension of the lesion to the pulp chamber. Although it is irrational to make a definite diagnosis based upon only radiographic appearance, clinical symptoms such as continuous pain were indicative that the defect had invaded the pulpal tissues.

The root canal treatment was performed after the reflection of the muco-periosteal flap. The removal of the granulation tissue from the resorptive defect and irrigation with sterile saline solution allowed easy access to the root canal. Yilmaz et al8 used a similar methodology for the treatment of an invasive cervical resorption of a maxillary canine. Heithersay9 suggested the use of 90% trichloroacetic acid for the complete debridement of the defective

Figure 2  (A) Reflection of the mucoperiosteal flap and curetting of the granulation tissue in the resorptive area. (B) Placement of mineral trioxide aggregate in the resorptive cavity following endodontic treatment. (C) Intraoral photograph taken 18 months later revealing healthy periodontal status and no disruption in the marginal integrity of the composite filling.
area. It was not possible to use such an application in the case we have presented due to the localization of the defect that prevented the accomplishment of a thorough isolation. The same comments were made by Yilmaz et al.8

Several treatment options have been advocated in the literature for the management of invasive cervical resorption, and it has been proposed that the severity and extent of the resorption is the major determining factor in the selection of the appropriate treatment methodology. When the case is very severe, a rapid orthodontic extrusion may be a suitable treatment modality.10 Smidt et al14 described the management of an invasive resorption by a multidisciplinary approach. Other treatment choices include intentional replantation and guided tissue regeneration. In our case, a combined treatment protocol that included endodontic, periodontal and restorative disciplines was selected.

The restoration of the defect was carried out using MTA due to its multiple beneficial properties, such as biocompatibility, antibacterial effect, insusceptibility to the presence of moisture or blood and induction of periodontal attachment formation. This material has a wide range of applications including pulp capping, pulpotomy, apexification procedures, formation of an apical barrier, root resorptions and retrograde fillings. The use of MTA in external resorptions has been reported in a number of articles.11–13

Fibroblast adhesion and the regeneration of a periodontal ligament are anticipated in the outcome of this procedure. There is information available in the literature favoring MTA usage to achieve this. Raldi et al14 investigated the fibroblast attachment and morphological changes of simulated root resorptions after irradiation with high-power lasers and the use of MTA. The authors used various doses of irradiation with lasers as well as MTA and concluded that although MTA showed relatively lower biocompatibility compared to the irradiated groups, it had the capacity to allow adhesion. Another study attempted to assess the cell adhesion of osteoblasts in root-end fillings.15 It was suggested that the low cytotoxicity exhibited by MTA may be related to the initial high pH value of the freshly mixed MTA, which might induce morphological alterations in cells and lysis of cells in direct contact with the material. Set MTA, in contrast, demonstrated favorable biocompatibility with no observed effect on cell morphology and a limited impact on cell growth at 72 hours. Reports revealing the stabilization of the resorptive process have been also been published in the literature.11,16 Glass ionomers, amalgam and composite are other options that might be used for the obturation. Since the margins of the MTA repair material extended towards the coronal aspect of the tooth in this particular case, a composite filling material using a self-etch bonding system was applied on top of the partially reduced MTA in the appointment when the restorative procedure was undertaken. The studies regarding the effect of acid-etching on the physical and surface characteristics of MTA are quite limited. Kayahan et al17 applied acid-etching on MTA at various time intervals to evaluate the surface alterations under scanning electron micrography and compressive strength. They concluded that it is advisable to postpone the restorative procedures for at least 96 hours after mixing due to the significant changes in surface morphology and compressive strength over time. Taking the results of the abovementioned research into consideration, composite placement was performed 1 week after the application of MTA to prevent any disruption in the surface texture. A self-etch adhesive (AdheSE) was applied on MTA in the present case for the provision of bonding between MTA and the composite filling material. Although there are few studies on the influence of acid application on the surface characteristics of MTA, to our knowledge there is as yet no sufficient information regarding the adhesion between MTA and various types of dentin bonding agents. In case a composite filling needs to be done on MTA, no bonding such as one to dentinal tissues with the formation of a hybrid layer should be expected. With the conditioning procedures performed on MTA, however, a micromechanical interlocking between the bonding agent and MTA is created. The preliminary procedures were performed with meticulous care to obtain the optimal result from this approach. Although there is limited information in the literature regarding this issue, the points attention is drawn to in the available literature were specifically followed to provide a successful outcome. The 18-month follow-up period revealed a successful sealing potential for the composite restoration, with no disruption in the marginal integrity and discoloration. More research and accumulation of more valid data are warranted, however, to make a reliable recommendation regarding the bonding agent of choice to be used in combination with MTA.

The patient was further instructed about the significance of maintaining adequate oral hygiene and attendance at follow-ups. If the patient adheres to these factors, it can be expected that the tooth involved may serve the patient for a prolonged period.

This case has a favorable outcome where a compromised tooth with invasive cervical resorption has been preserved. The practitioner must keep in mind that if the resorption is detected in time, a collaborative approach may lead to eventual success in these clinically challenging cases. MTA might be a good option in the management of these types of cases due to its multiple advantages.

Conflicts of interest

The authors declare that there are no conflicts of interest that could influence their work.

References