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Management of external cervical resorption in maxillary molar- A case report

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Abstract

External cervical resorption is a destructive condition that results in the progressive loss of hard dental tissues, including enamel, cementum, and dentin. Despite its aggressive nature, the exact causes of this condition remain unclear. The approach to treatment varies based on the severity, location, and choice of restorative material. Effective management of these lesions requires careful consideration of the bone crest position and the ability of the periodontal tissue to integrate with the chosen material after it sets. This case report presents a clinical instance of external cervical resorption affecting the maxillary first molar, treated using a specific protocol that involves selecting different dentin substitute materials according to the lesion's position relative to the bone crest. The success of this treatment relied on proper material selection and meticulous tissue management. Combining various restorative materials has demonstrated promising outcomes in addressing resorptive lesions in both supra- and infra-osseous regions.

Keywords: External Cervical Resorption, Root Canal Therapy, Tooth Resorption, Mineral trioxide aggregate (MTA)

Introduction

Tooth resorption is an irreversible process that leads to the breakdown of mineralized tissues, including cementum and dentin, as a result of odontoclastic activity [1, 2]. Both primary and permanent teeth can undergo resorption. In primary teeth, this is a natural physiological phenomenon that facilitates their shedding, allowing permanent teeth to emerge [3]. However, in permanent teeth, resorption is a pathological condition that leads to structural damage and potential tooth loss [4].

Root resorption is classified into internal or external types, depending on its location on the root surface [3, 5]. External root resorption has multiple subtypes, with external cervical resorption (ECR) being among the least understood and least common [5]. Cervical root resorption accounts for roughly 4% of all external root resorption cases [6]. Additionally, Heithersay introduced the term "invasive cervical resorption" to describe a more aggressive and progressive variant of cervical resorption [7]. ECR occurs in the cervical portion of the tooth, either beneath the epithelial attachment or in the coronal segment of the bone [8].

According to existing literature, two primary mechanisms have been proposed for the development of ECR. The resorption process may either be initiated by sulcular microorganisms that induce an inflammatory response or by a benign proliferative fibro-osseous or fibrovascular process, in which microorganisms act as secondary invaders rather than primary contributors [9-11]. However, the precise etiology of ECR remains uncertain [12, 13]. Several studies have identified potential risk factors associated with the condition, including orthodontic treatment, dental trauma, internal bleaching, periodontal therapy, malocclusion, parafunctional habits, poor oral hygiene, intra-coronal restorations, and various surgical procedures such as orthognathic surgery or adjacent tooth extractions. Other contributing factors include eruption abnormalities, viral infections, systemic diseases, and genetic predisposition [7, 14-16].

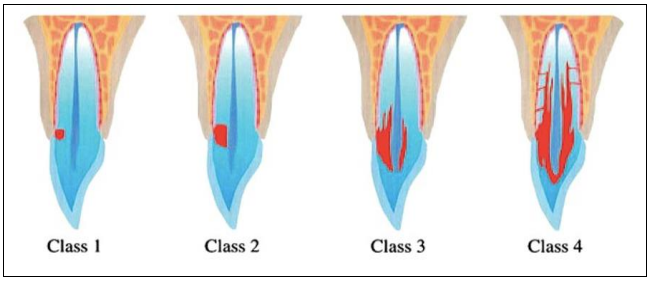
A few case reports have suggested a possible link between the feline herpes virus and ECR, demonstrating that the virus can be transmitted either directly or indirectly from domestic, captive, or wild cats, potentially resulting in cervical resorption lesions in humans [17-19]. Furthermore, systemic conditions such as Paget's disease, herpes zoster infection, hyperparathyroidism, hypothyroidism [14], normocalcemic hypercalciuria, nephrolithiasis [20], neoplasia [21], hyperoxaluria, and oxalosis [22] have also been proposed as potential causes of ECR.

Diagnosing and managing ECR can be particularly challenging due to its subtle clinical manifestations and rapid progression [4, 23]. The condition is often asymptomatic until it reaches the pulp [24]. In most cases, ECR is identified incidentally during routine radiographic examinations, with the only visible clinical indicator being pink discoloration of the crown due to the presence of highly vascular granulation tissue [14, 25].

Heithersay [7] introduced a classification system for cervical resorption based on clinical and radiographic features:

- **Class I:** A small resorptive lesion localized in the cervical region with minimal penetration into dentin.

- **Class II:** A well-defined invasive lesion extending near the coronal pulp but with little to no involvement of root dentin.
- **Class III:** A more extensive resorptive process affecting both coronal dentin and extending to at least the coronal third of the root.
- **Class IV:** A severe invasive resorption extending beyond the coronal third and reaching the middle third of the root canal.



Heithersay clinical classification of invasive cervical resorption.

Various surgical and nonsurgical methods have been suggested for ECR management [2]. However, there is no standardized treatment protocol. Class 1 lesions typically require thorough debridement of affected tissues followed by cavity restoration [9, 26]. If the lesion is close to the pulp, as in Class 2 and Class 3 cases, root canal therapy may be necessary, particularly when there is a risk of pulp exposure during granulation tissue removal [9, 26]. In instances where the cervical lesion is inaccessible, surgical procedures such as guided tissue regeneration, crown lengthening, or intentional replantation may be required [9, 22, 26]. Some researchers have also proposed orthodontic extrusion combined with an apically positioned flap as a viable option in cases where esthetic concerns are a priority [9, 26]. For Class 4 lesions, where the tooth is considered non-restorable, extraction is generally the preferred course of action [26]. Accurate diagnosis and thorough evaluation of the lesion's size and location are crucial in determining the most appropriate treatment approach [2].

Given the limited availability of case reports on ECR in existing literature, this case report aims to present a detailed and systematic approach to the assessment and management of ECR affecting the maxillary first molar, utilizing advanced diagnostic tools such as cone beam computed tomography (CBCT) and two-dimensional radiographic imaging.

Case Report

A 23-year-old male patient visited the Department of Conservative Dentistry and Endodontics with discoloration in the upper left maxillary first molar (#26). Clinical examination revealed a pinkish hue on the crown of #26 along with mild swelling on the palatal aspect [Fig 1a].

The patient's medical history was unremarkable. He reported noticing a gradual change in the tooth's color, which had intensified over the past 3–4 months. His dental history indicated that he had experienced trauma while biting four years ago, which had not received any treatment. The electric pulp test showed no response. Periodontal probing depths were within the normal range at all sites except on the palatal surface, where necrotic material was detected.

A preoperative intraoral periapical (IOPA) radiograph [Fig 1b] revealed a large, irregular radiolucent area in the central crown portion of the tooth at a supra-osseous level. To aid in diagnosis and treatment planning, cone-beam computed tomography (CBCT) was performed (Fig 2). The axial, coronal, and sagittal views (Figs 2a, 2b, 2c) confirmed the presence of external cervical resorption (ECR) in tooth #26. The lesion was well-defined, located near the coronal pulp, with a possible connection to the pulp chamber and also extension into the root dentin. Based on these findings, a diagnosis of asymptomatic irreversible pulpitis was established for tooth #26. Consequently, a combination of endodontic and surgical procedures was planned to eliminate the communication between the pulp chamber and the resorptive defect. The treatment plan was explained to the patient in detail, and written informed consent was obtained.

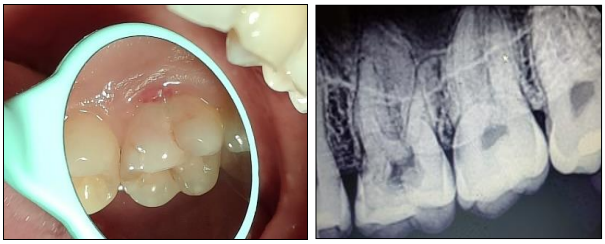


Fig 1: (a) Preoperative picture, (b) Preoperative radiograph

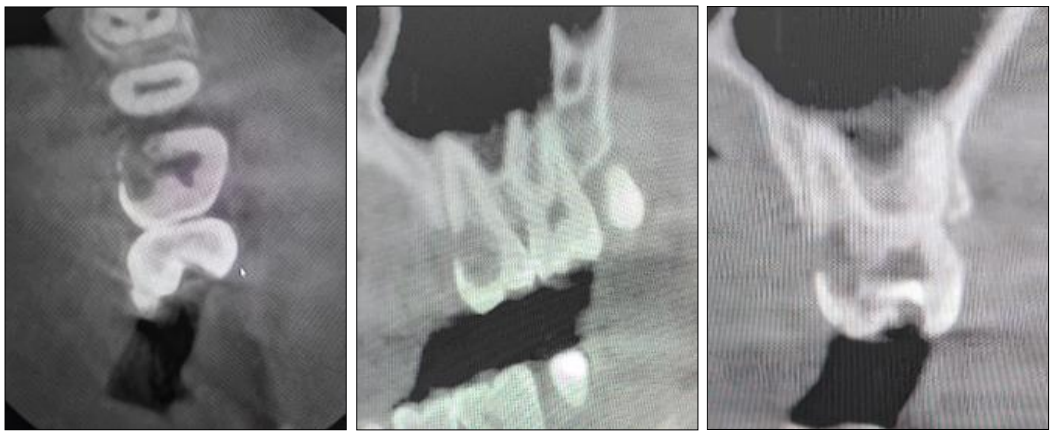


Fig 2: Cone beam computed tomography (CBCT) of the left maxillary first molar- (a)axial, (b)coronal, (c)sagittal views confirmed the presence of external cervical resorption (ECR) showing lesion is well-defined, located near the coronal pulp, with a possible connection to the pulp chamber and also little extension into the root dentin.

Treatment Approach

The treatment strategy included root canal therapy, debridement, curettage, and restoration of the external resorption defect, along with a crown lengthening procedure. After discussing the procedures with the patient, local anesthesia was administered, and access cavities were created on the occlusal surface of #26 [Fig 3a].

The working length was determined, and biomechanical preparation of the root canals was carried out using manual #K-files, with irrigation performed using 3% sodium hypochlorite (NaOCl) (Parcan, Septodont Healthcare India Pvt. Ltd., India) [Fig 3b]. Following complete debridement, the canals were rinsed with sterile water and dried using paper points.

Since the defect was located in the cervical region, surgical intervention was necessary. Local anesthesia was administered on the palatal side, and a minimally invasive crown lengthening procedure was performed using a laser to expose the cervical margin of the tooth, facilitating thorough curettage of the resorptive defect [Fig 3c]. A well-defined circular resorptive lesion containing granulation tissue was observed from the palatal side.

The defect was cleaned using alternating rinses of 3% NaOCl and 17% ethylenediaminetetraacetic acid (EDTA) (Prime Dental Product Limited, India) [27]. NaOCl was used for its antibacterial properties and ability to fix organic tissue, while EDTA was employed for its regenerative potential, including the release of TGF β-1 from human dentin to enhance clinical outcomes [28]. Curettage was performed to efficiently remove the granulomatous tissue from the surgical site.

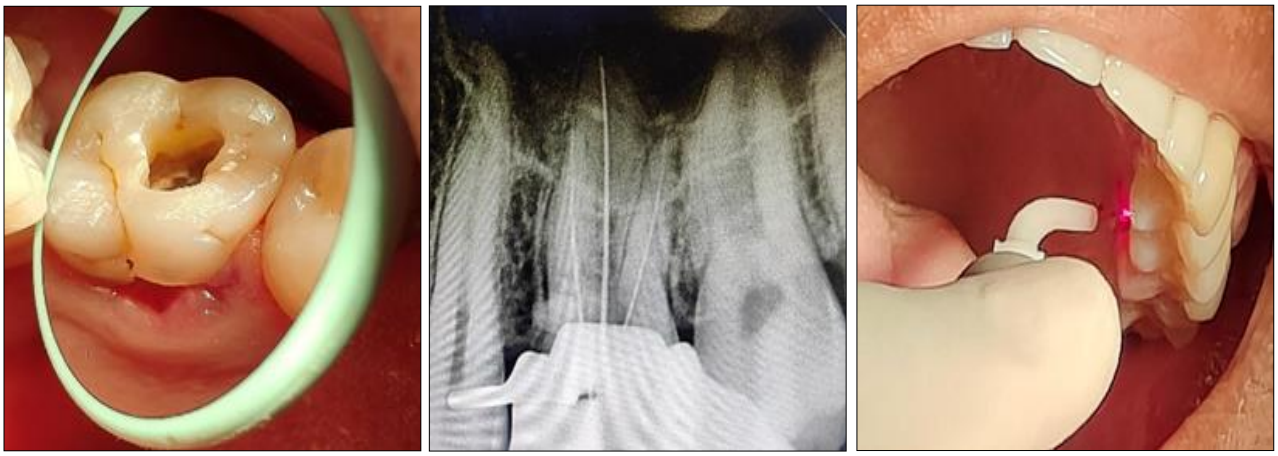


Fig 3: (a)Access opening clinical picture, (b) Working length determination radiograph, (c) Surgical crown lengthening procedure on palatal aspect of #26.

After ensuring the site was dry, a Gutta-percha (GP) point was placed in the root canal for sealing, and the resorptive defect was restored using mineral trioxide aggregate (MTA) prepared according to the manufacturer's instructions [Fig 4a]. The material was shaped to match the external root anatomy and allowed to set for 15 minutes to achieve initial hardness. Once the setting of MTA was confirmed, the root canals of #26 were obturated using GP points and sealed with Apexit Plus (Ivoclar Vivadent). The access cavity was temporarily sealed with Cavit-G [Fig 4b].

To protect the treated area, a temporary coe-pak dressing was applied over the defect, and the patient was advised to return after a week for its removal [Fig 4c]. A postoperative IOPA radiograph was taken. After removing the coe-pak, MTA was overlapped with the composite resin and the patient was instructed to attend regular follow-up visits [Fig 5].

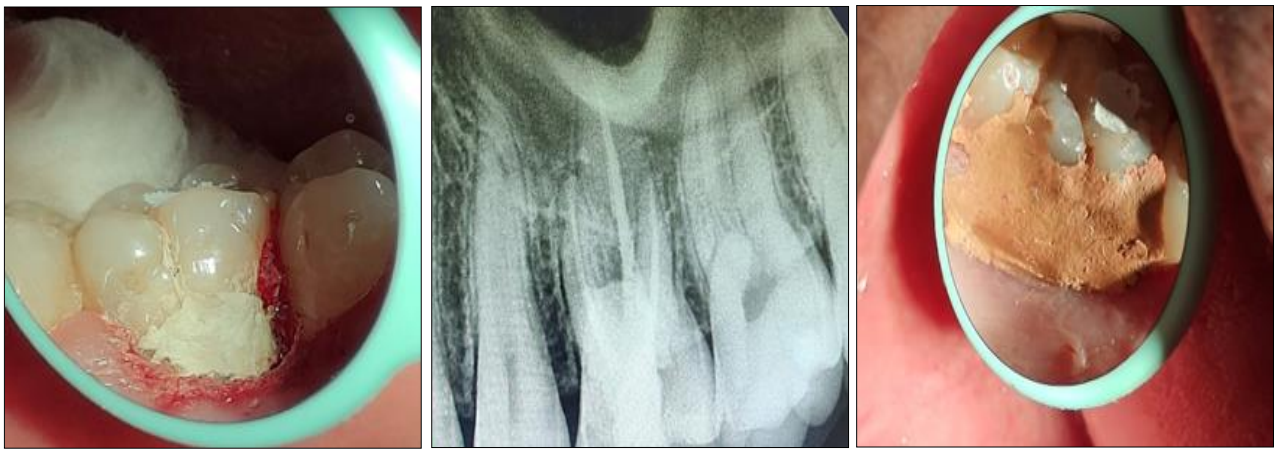


Fig 4: (a) Resorption defect filled with mineral trioxide aggregate (MTA), (b) Postoperative radiograph of #26 after obturation and resorption defect filled with MTA, (c)Temporary dressing given (coe-pak).

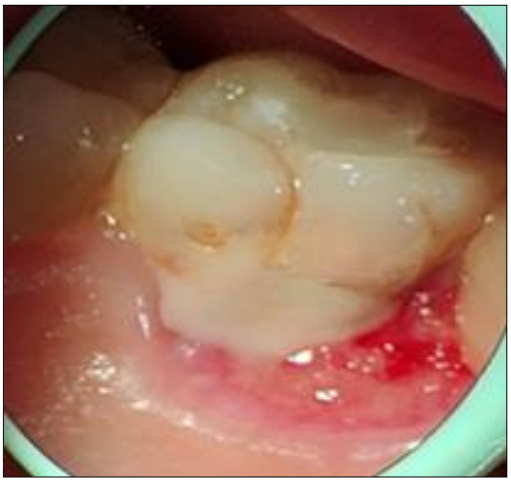


Fig 5: Clinical picture after temporary dressing removal and MTA was overlapped by composite resin.

However, the patient returned for evaluation only after 11 months. At that time, he was completely asymptomatic. Clinical and radiographic assessments of the treated tooth [Fig 6a, 6b] confirmed successful repair of the resorptive defect with MTA.

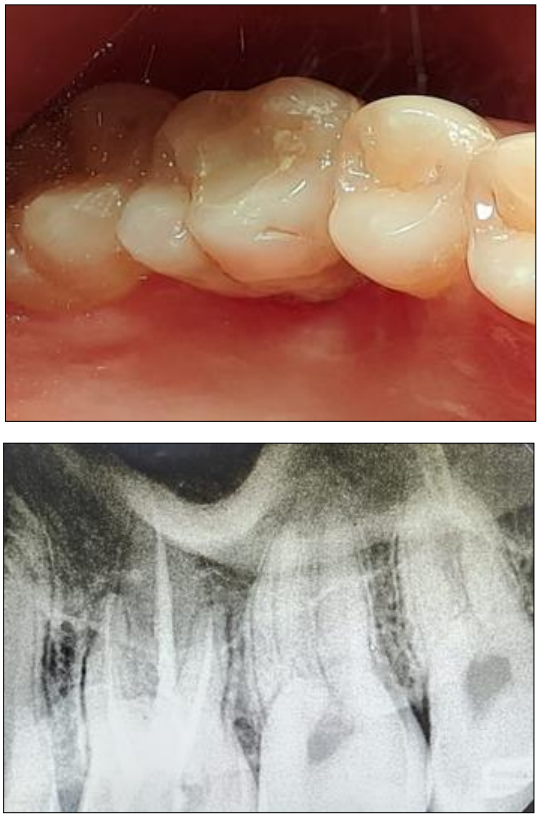


Fig 6: Postoperative (a) Clinical picture, (b) Radiographic picture after 11 month follow up.

Discussion

The present case report and its management demonstrated a favorable prognosis, as the resorptive lesion was situated near the coronal pulp without extending into the radicular dentin, thereby enhancing the longevity of the treatment.

Dental trauma is recognized as a primary factor associated with invasive cervical resorption (ICR) since it can compromise the cementum, periodontal ligament, and surrounding alveolar bone. Additionally, trauma can contribute to transient apical rupture, external replacement resorption, internal resorption, and ICR [29]. The teeth most frequently affected by this condition include maxillary incisors, canines, maxillary first molars, and mandibular first molars [7].

Previous studies conducted by Heithersay et al. and Bachesk et al. [7, 30] initially identified various potential predisposing factors for ICR, including orthodontic treatment, dental trauma, internal bleaching, oral or dental surgeries, bruxism, and restorative procedures. Furthermore, Patel et al. [31] and Schwartz et al. [32] reported additional factors that may contribute to the onset of resorption, such as extraction of adjacent teeth, malocclusion, periodontitis, auto-transplantation, herpes zoster infection, wind instrument playing, and bisphosphonate use. Mavridou et al. [15] and Gunst et al. [33] conducted descriptive analyses of ICR-associated factors, identifying orthodontic treatment (45.7%), dental trauma (28.5%), and parafunctional habits (23.2%) as the most frequently reported causes. Moreover, Patel et al. [31] emphasized that ICR exhibits an atypical and complex pattern of invasion, necessitating a thorough evaluation of its size, location, and circumferential extent.

Successful ICR treatment relies on accurate diagnosis, classification, and appropriate treatment planning [34]. Heithersay [7] introduced a classification system for cervical resorption based on clinical and radiographic features, the present case was identified as Class III. However, Heithersay's classification has limitations, as ICR exhibits varying radiographic appearances that may be inconclusive in two-dimensional imaging [35]. The challenge of early ICR detection is well-documented, as the condition often remains asymptomatic until it reaches an advanced stage [36, 37]. Therefore, when ICR is suspected based on radiographic findings, clinicians should consider CBCT imaging to accurately assess lesion size, location, extent, portal of entry, circumferential spread, and proximity to the root canal [38, 39].

Patel et al. [31] proposed a three-dimensional classification system for ICR, incorporating lesion height, circumferential spread, and proximity to the root canal. The lesion height is best assessed through CBCT axial, coronal, and sagittal views. According to this classification, the lesion in the present case was categorized as Grade I, indicating a supra-crestal defect. The circumferential involvement, determined through CBCT axial slices, was classified as Grade B (>90° - ≤180° spread). Additionally, the lesion's proximity to the root canal was designated as P (proximity), suggesting probable pulp involvement.

ICR treatment is influenced by factors such as lesion severity, location, size, and the pathway of microbial invasion [40]. Surgical intervention is considered when non-surgical methods cannot effectively eliminate the inflammatory stimulus. This approach typically involves flap elevation and curettage of the affected cervical area to remove pathological tissue that may impede the repair process, as frequently observed in radiographic assessments [41].

Mineral trioxide aggregate (MTA) has been recommended as the preferred restorative material due to its beneficial properties, including superior sealing ability, biocompatibility, bactericidal effects, and its capability to set in the presence of moisture while promoting new cementum formation. To enhance aesthetics, the supragingival portion of the lesion can be restored using a resin-based composite material [42].

Conclusion

This case report presents the successful management of an external cervical resorption (ECR) with both supra- and infra-bony resorption using a protocol that incorporates various restorative materials. It emphasizes the necessity of a thorough clinical and radiographic evaluation to determine the most suitable treatment approach. The success of this intervention was attributed to the selection of appropriate materials and meticulous tissue management. The combined use of different materials has demonstrated promising results in addressing resorptive defects in both supra- and infra-osseous regions.

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