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Case Report

Management of external invasive resorption: A case report

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ABSTRACT

Invasive cervical resorption (ICR) is a particularly aggressive form of external tooth resorption that originates in the cervical region of the involved tooth. The primary treatment objective is to completely remove all the resorbing tissues and restoration of the resorptive defect using an appropriate filling material to achieve functional and aesthetic demands. Managing defects that extend both towards the crown and root can be particularly challenging.

This case report describes the management of a case of Class 3 (Heithersay classification) and 2Bp (Patel 3D classification) ICR in the maxillary right central incisor. The approach involved a surgical procedure to remove the affected tissue followed by restoration of the defect using a tri-layered combination of Biodentine, resin-modified glass ionomer cement and composite resin.

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1. Introduction

The mineralized tissues of permanent teeth are protected in the root canal by predentin and odontoblasts and on the root surface by precementum and cementoblasts.^{1–3} Disruption of the precementum layer will cause multinucleated cells to colonize the mineralized or denuded surfaces and resorption will ensue.⁴ External cervical resorption (ECR), which is also termed invasive cervical resorption (ICR) is a relatively uncommon, insidious and often aggressive form of external tooth resorption may occur in any tooth of permanent dentition. Invasive cervical resorption is defined as a localized resorptive process that commences on the root surface below the epithelial attachment and the coronal aspect of the supporting alveolar process, i.e., the zone of the connective tissue attachment.⁵ Characterized by its location and invasiveness, this resorptive process leads to progressive

and destructive loss of tooth structure.⁶ Trauma, orthodontic treatment, intracoronal bleaching and surgical procedures could be the potential predisposing factors for ICR.⁷

ICR is usually asymptomatic and is often detected when the affected tooth presents with a pink discoloration in the cervical region of the crown, as highly vascular resorptive tissue becomes visible through the resorbed overlying dentine and thin enamel or with a probable defect near the cemento-enamel junction. Radiographic examination reveals an irregular radiolucency with ragged margins or ‘moth-eaten’ appearance.^{8,9} Accurate diagnosis and treatment plan can be executed with three-dimensional (3D) imaging techniques such as cone-beam computed tomography (CBCT), which shows the exact extent of an ICR lesion and proximity of the lesion to the pulp space.¹⁰

Successful management of ICR involves cessation of the resorptive process and restoration of the lost tooth structure. Various materials have been used to seal the

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resorptive defect such as mineral trioxide aggregate (MTA), glass ionomer cement and calcium-enriched mixture.¹¹ Bioactive materials like Biodentine (Septodont, St. Maur-des-Fossés, France) can be a useful option since its properties such as compressive strength, elastic modulus and microhardness are comparable with that of natural dentine, making it an ideal substitute for dentine. Since the resorptive defect is invasive and involves coronal and radicular portions, employing a combination of materials becomes inevitable.^{12,13}

This case report presents a successful management of ICR in maxillary right central incisor surgically managed and restored using tri-layered restorative technique.¹⁴

2. Case Report

A 21-year-old male patient reported to the Department of Conservative Dentistry & Endodontics with a complaint of mild pain and discoloration of the upper right front tooth. Patient gave a history of a trauma. Medical and family history were noncontributory. The tooth was found to be nonvital on electric pulp test (EPT) and thermal test. Periodontal probing depths were physiological and no mobility was observed.



Figure 1: a: Preoperative intraoral photograph; **b:** Preoperative periapical radiograph

On clinical examination, a defect was noticed at the cemento-enamel junction with reddish irregularity at the gingival margin (Figure 1a). Radiographic examination revealed an irregular radiolucency having a mottled appearance involving the coronal dentine and extending to the coronal third of the root suggestive of ICR. The lesion had well-defined borders and the root canal was visible through the lesion suggesting that the lesion was external to the root canal (Figure 2b). A cone-beam computed tomography (CBCT) scan was conducted to assess the size and depth of the lesion. Based on the CBCT images and 3D reconstructions, a diagnosis of invasive cervical external resorption of Class 3 (Heithersay classification)⁶ and 2Bp (3D classification) of Patel et al¹⁵ was determined (Figure 2).

Based on the management protocols suggested by Heithersay,⁶ treatment plan included both the external and internal repair comprising endodontic treatment and surgical intervention for removal of the inflamed granulation

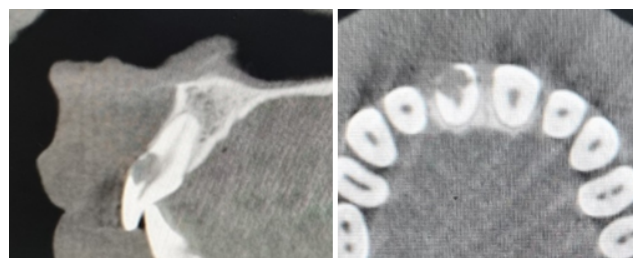


Figure 2: Cone-beam computed tomography images in axial and sagittal sections

tissue that occupied the resorption cavity and repair of the defect with triple layer of Biodentine, resin ;modified glass ionomer cement, and composite resin.

Procedures were explained to the patient and consent was obtained. Under local anesthesia, the access cavity preparation was done on the palatal surface. After working length determination, the root canal was prepared biomechanically i.e. cleaning and shaping with manual instruments using K-files and enlarged upto S2 (NeoEndo) and finished with F2 (NeoEndo). 5.25% NaOCl was used for irrigation. Corticosteroid-antibiotic paste was placed as the intracanal medicament. After complete debridement of the canal, the labial defect was curetted off the granomatous tissue and temporary filling was placed.

In second appointment, a rectangular full thickness mucoperiosteal flap was reflected on the labial aspect following infiltration anesthesia (Figure 3a). The temporary filling was removed and remaining granomatous tissue was removed with the help of a discoid excavator. A small cotton pellet was then dipped in 90% trichloroacetic acid and the excess was removed by dabbing it on a piece of gauze. Next, cotton pellet was gently pressed over the area of resorptive defect for approximately 1 minute. Following this, the uneven edges of the defect were smoothed using a small round bur. An F2 GP cone was inserted into the root canal to maintain the canal space. Biodentine (Septodont, St. Maur-des-Fossés, France) was prepared following the manufacturer's guidelines and compacted thoroughly into the resorptive defect. After placement, Biodentine was allowed to set for 15 minutes to reach its initial setting and achieve adequate hardness (Figure 3b). Resin modified glass ionomer cement (RMGIC) (Fusion i-Seal, Prevest DenPro, Jammu, India) was placed over the Biodentine upto the level of CEJ (Figure 3c). Composite (Ivoclar Vivadent Te-Econom Plus) was placed over RMGIC upto the gingival margin. Flap was sutured with 30 black silk suture material and a periodontal pack was placed (Figure 4a). The patient was advised to return in one week for the removal of the sutures. Postoperative intra-oral periapical radiograph was taken (Figure 4b).

Two weeks later, access cavity was reopened and calcium hydroxide intracanal medicament was placed for a period



Figure 3: a: Surgical exposure of resorption defect; b: Placement of Biodentine over the resorption defect; c: Placement of RMGIC at cemento-enamel junction.

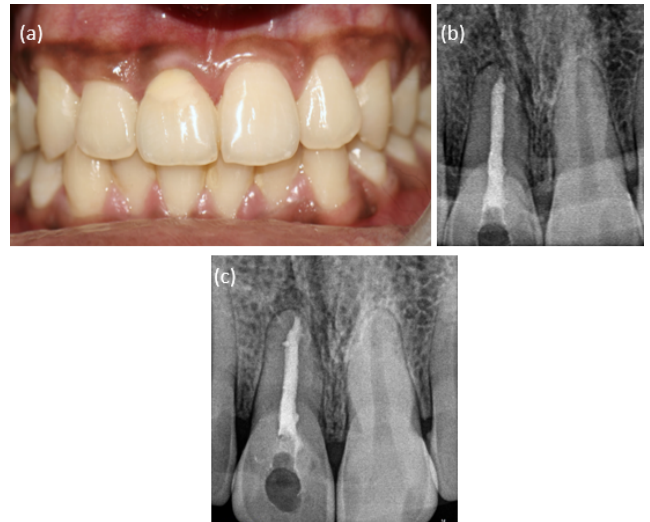


Figure 5: a: Postoperative photograph after 2 weeks; b: Post-operative radiograph showing calcium hydroxide intracanal medicament; c: Post obturation radiograph



Figure 4: a: Immediate postoperative photograph; b: Immediate postoperative radiograph



Figure 6: a: Follow-up photograph after 1 year; b: Follow-up radiograph after 1 year

of 3 weeks (Figure 5b). Obturation was completed using thermoplasticized obturation technique with BioActive RCS (Safe Endo) bioceramic sealer (Figure 5c). Permanent restoration was given with RMGIC and composite. The patient was recalled at 3 months and 6 months for follow-up. At 1-year follow-up, the patient was completely asymptomatic (Figure 6a,b). Clinical and radiographic evaluation did not reveal any recurrence of the resorption, gingival healing appeared complete with normal probing depth and no loss of clinical attachment.

3. Discussion

Invasive cervical resorption is an insidious type of external root resorption that can occur following dental trauma, particularly luxation injuries. It originates from cells found in the periodontal ligament and is identified by the infiltration of fibrovascular tissue into the cervical region of the tooth. This tissue gradually resorbs dentin, enamel and cementum.¹⁶ The invasive and somewhat aggressive characteristics of the process raise questions as to the nature of the lesion.⁶

It can begin and advance without causing symptoms, often being detected during routine radiographic or clinical examinations. It is sometimes difficult to distinguish this lesion from internal root resorption. Therefore, CBCT

can be highly beneficial in diagnosing invasive cervical resorption (ICR). Early diagnosis is very important in the successful management of these patients.¹⁷

Various authors have proposed different treatment approaches for managing ICR. However, the primary objective remains the complete removal of resorptive tissue and the restoration of the affected area.^{13,18} In our case, being ICR, which had significantly damaged the tooth structure below the CEJ, a surgical exposure was planned followed by three-layered restoration. Since the tooth was non-vital, endodontic treatment was planned for the same.

Resorption defect included both radicular and coronal portions. After complete debridement of the defect, Biodentine was selected for restoration of the root surface due to its bioactivity and biocompatibility with the peri-radicular tissues. Mechanical properties being dentine-like, it can be used as a dentine substitute for coronal and radicular portions. Also, Biodentine releases calcium ions which enhances the alkaline environment that supports osteoblastic activity. Moreover, calcium and hydroxide ions promote the release of pyrophosphatase,

alkaline phosphatase and bone morphogenetic protein-2, thereby supporting the process of regeneration and mineralization.^{13,19} Various studies have shown that when Biodentine was used to seal perforations in the furcal area, it induced the repair of the periodontium and new cementum formation over the material.¹²

As Biodentin placed on the coronal aspect cannot be polished, its rough surface when exposed to the oral environment can promote development of subgingival plaque. A layer of RMGIC was placed over Biodentin upto the level of CEJ because it provides adhesion to the tooth structure, enhances aesthetics, releases fluoride and offers a surface that can be etched and bonded for subsequent resin restoration.^{20,21} Composite resins when placed on the coronal aspect can be greatly polished and aesthetically can give good results. However, they are not biologically suitable for periodontal tissues and therefore cannot be placed in the subgingival region.^{21,22}

During endodontic treatment, intracanal medicament like corticosteroid-antibiotic combination paste was placed initially followed by calcium hydroxide. Immediate placement of corticosteroid-antibiotic combination paste had significantly less resorption, more healing and more residual root mass than calcium hydroxide intracanal medicament. Calcium hydroxide when placed in early stages of treatment may predispose the tooth to ankylosis and replacement resorption.²³ Calcium hydroxide, when employed as a root canal medicament releases hydroxyl ions that diffuse through the dentinal tubules and cementum to reach the periodontal ligament (PDL), which is faster in cases when cementum is removed by either trauma or resorption. In such cases, the pH in the outer dentin can reach levels of approximately 8.0-9.5, which exceeds the level of 7.8 where attachment and growth of human PDL fibroblasts decrease. In later stages when inflammation has resolved, calcium hydroxide-based intracanal dressing encourages alkalization of the environment, which supports stabilizing the resorption process.²⁴

The treatment of the invasive cervical resorptive defect restored using a three-layered technique was deemed successful based on clinical and radiographic assessments at the 12-month follow-up. However, regular annual follow-ups are necessary to assess the long-term success and prognosis of the treatment.

4. Conclusion

Timely diagnosis, thorough removal of the resorptive defect, and appropriate restorative management typically result in a successful outcome and long-term retention of the tooth. Numerous studies have demonstrated that external cervical resorption (ECR) exhibits an unusual and intricate pattern of invasion which can make assessment challenging. The use of CBCT facilitated the selection of a more suitable treatment plan to effectively manage these lesions.

As the defect involves coronal and radicular portions of the teeth, a modified treatment protocol is needed for successful outcome. Using a combination of different restorative materials can be a beneficial option for achieving improved outcomes, as demonstrated by trilayered restorations. While this case report demonstrates a positive clinical outcome, additional studies are needed to provide more comprehensive information for restoration of invasive cervical resorptive (ICR) defects.

5. Source of Funding

None.

6. Conflict of Interest

None.

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