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CASE PRESENTATION

Use of endodontics and bone regeneration in the treatment of external root resorption: a clinical case report

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ABSTRACT

Introduction: external root resorption is a progressive dental pathology that compromises tooth stability and may lead to the loss of the affected organ, requiring an interdisciplinary approach.
Objective: to describe the therapeutic approach applied in a clinical case of external root resorption.
Case presentation: a 17-year-old male patient with a history of trauma to the upper left central incisor presented with pain during chewing and a vestibular fistula. Clinical examination revealed percussion sensitivity and local inflammatory signs, while tomography showed external root resorption and a diffuse bone lesion. Treatment included endodontic therapy with chlorhexidine irrigation, intracanal medication with calcium hydroxide, and obturation using Biodentine bioceramic. Subsequently, apical surgery was performed through a full-thickness flap, curettage of the lesion, and apical sealing with mineral trioxide aggregate. Bone regeneration was achieved using bovine-derived xenograft and a pericardial collagen membrane, followed by mattress sutures to ensure proper healing. Clinical and radiographic follow-up demonstrated symptom resolution, bone recovery, and adequate periradicular healing, confirming the effectiveness of the applied protocol.
Conclusions: the combination of endodontics, apical surgery, and bone regeneration proved to be an effective strategy for managing external root resorption. This approach promoted tissue repair and functional preservation of the tooth, highlighting the importance of early interventions and integrated protocols to optimize prognosis in young patients with traumatic history.

Keywords: Endodontics; Bone Regeneration; Root Resorption.

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INTRODUCTION

External root resorption (ERR) is a dental condition characterized by progressive loss of bone tissue surrounding the root of the affected tooth, which can lead to tooth loss if not addressed promptly. This condition occurs when an infected root canal system affects the external surface of the root, compromising both cementum and the periodontal ligament. ERR may be triggered by traumatic injuries—such as luxation or avulsion—or by the presence of a communication pathway between the root canal system and the periradicular tissues, allowing bacteria and their endotoxins to escape into these areas.[1,2,3,4]

Bacteria and their endotoxins trigger an inflammatory response; if inflammation is already present due to prior injury, the escape of bacteria or endotoxins can exacerbate the existing inflammation. If the infected root canal system remains untreated, inflammation will persist, and clastic cells will become activated to resorb both the tooth and surrounding bone. [5,6,7]

ERR can manifest in various forms, including external inflammatory root resorption (EIRR), often resulting from severe dental trauma. In immature teeth, treatment is more complex due to incomplete root development and the tendency for damage to progress, potentially jeopardizing long-term tooth viability. Endodontic management of ERR typically involves placement of a mineral trioxide aggregate (MTA) apical plug, which acts as an apical barrier to halt resorption and promote bone healing. [8,9,10,11]

However, bone regeneration techniques and pulp revascularization have provided new alternatives, especially in immature teeth. Pulp revascularization enables pulp tissue regeneration and new bone formation, halting resorption progression and promoting apical bone growth. Treatment selection depends on several factors, including the extent of resorption and the clinical response of the affected tooth. [12,13,14,15]

In summary, external root resorption presents significant clinical challenges. Endodontic techniques and bone regeneration strategies—such as pulp revascularization—offer distinct benefits and outcomes in managing this condition. This context motivated the present study, which aimed to describe the therapeutic approach applied in a clinical case of external root resorption.

CLINICAL CASE REPORT

A 17-year-old male patient with no relevant medical history presented with masticatory pain and a vestibular fistula associated with tooth #2.1. As medical history, the patient reported a traumatic dental injury involving tooth #2.1 two years earlier, during which he also sustained a mandibular injury. On clinical examination, tooth #2.1 showed no response to cold sensitivity testing, moderate pain upon percussion, and soft tissue tenderness to palpation. Redness of the vestibular sulcus, intraoral swelling, and a fistula at the middle third of the root were observed. No tooth discoloration was noted, and periodontal evaluation revealed a clinically healthy tooth.

Cone-beam computed tomography (CBCT) (Fig. 1) revealed apical canal deformation consistent with external root resorption, along with a diffuse, ill-defined periapical lesion primarily affecting the vestibular cortical plate.

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Fig. 1 CBCT scan of tooth #2.1.

Endodontic preparation and treatment were initiated using 2 % chlorhexidine irrigation to explore the root canal. For working length determination (Fig. 2), an electronic apex locator (Propex Pixi®, Dentsply Sirona) and a size 80 K-file (Dentsply Maillefer, 21 mm) were used, establishing a working length of 16 mm.

Fig. 2 Final radiograph of tooth #2.1.

Intracanal medication with calcium hydroxide and propylene glycol was placed, and the access cavity was temporarily sealed with glass ionomer cement. Biomechanical preparation was performed manually using third-series K-files (Dentsply Maillefer). Irrigation with 2 % chlorhexidine was activated using the EndoActivator device for three 1-minute cycles. At the final obturation stage, a capsule of Biodentine was prepared according to the manufacturer's instructions. A portion of the bioceramic material was placed into the apical 5 millimeters of the canal using a Machtou 3/4 condenser, followed by a control radiograph.

Subsequently, surgical access to the lesion site was achieved via a full-thickness mucoperiosteal flap (Fig. 3). Apical curettage was performed, and the area was irrigated with 2 % chlorhexidine diluted in physiological saline. The apical region was sealed with MTA to create a well-sealed apical barrier.

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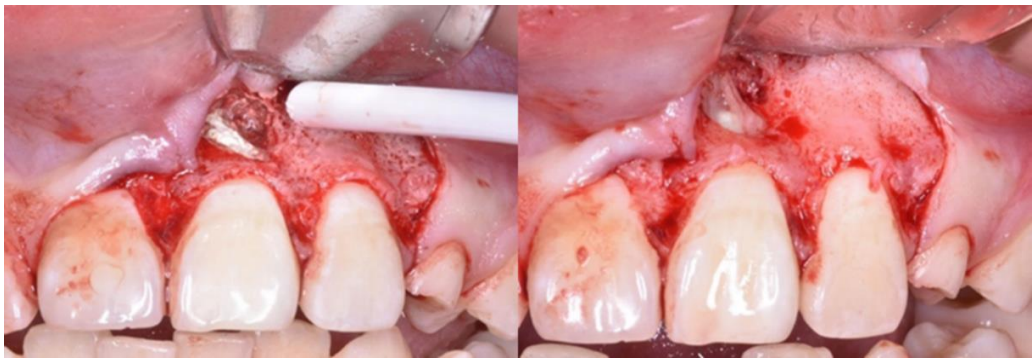

Fig. 3 Area of external root resorption and presence of granulation tissue.

During the surgical procedure, bone regeneration was carried out in the affected area using a bovine xenograft (Bionnovation, 0.5 g). The material was carefully placed into the previously prepared vestibular bony defect (Fig. 4) to promote new bone formation and provide adequate structural support for tissue repair. The choice of xenograft was based on its osteoconductive properties, which facilitate progressive integration with host bone and stimulate regeneration of the compromised area.

Fig. 4 Bone regeneration using bovine xenograft (Bionnovation, 0.5 g) applied to the vestibular bony defect.

To protect the bone graft and establish a barrier that supports optimal bone regeneration, a bovine pericardial collagen membrane (Bionnovation, Surgitime Dental Collagen Membrane, 20 × 30 mm) was placed, as shown in Figure 5.

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Fig. 5 Placement of a pericardial collagen membrane as a protective barrier over the bone xenograft in the vestibular defect.

In the final phase of the procedure, the flap was sutured using a mattress and figure-eight technique (Fig. 6) with 5-0 nylon suture. This maneuver allowed precise approximation of the tissue edges, ensuring adequate closure of the surgical site and promoting primary healing. The hermetic flap closure contributed to the protection of the bone graft and the previously placed collagen membrane, optimizing conditions for tissue regeneration and functional recovery of the periradicular area.

Fig. 6 Suturing and closure of the flap.

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DISCUSSION

External root resorption (ERR) is a common complication following dental trauma, particularly in young patients, and its progression can compromise tooth viability. The literature indicates that periradicular inflammation and exposure of root cementum promote the activation of clastic cells responsible for resorption. In this case, the traumatic history and the presence of a vestibular fistula were key diagnostic factors.[2,4,5]

The initial endodontic approach—using chlorhexidine irrigation and intracanal medication with calcium hydroxide—aligns with well-established protocols to control infection and modulate clastic activity. Calcium hydroxide, in particular, has demonstrated antibacterial properties and the ability to induce tissue repair, making it a standard in the management of inflammatory external root resorption.[6,8]

Obturation with bioceramics such as Biodentine and apical sealing with mineral trioxide aggregate (MTA) represent significant advances in endodontic therapy. These materials exhibit bioactive properties that stimulate hard tissue formation and ensure a hermetic seal, thereby halting resorption progression. In this case, their use facilitated apical healing and functional tooth preservation.[1,13]

Apical surgery combined with bone regeneration techniques is an effective strategy when the vestibular cortical plate is compromised. The use of bovine xenografts and collagen membranes has shown positive outcomes in bone neoformation due to their osteoconductive properties and ability to act as a barrier against epithelial cell migration. This approach enabled structural recovery of the affected area.[9,10,14]

Clinical and radiographic follow-up demonstrated symptom resolution and bone regeneration—findings consistent with previous reports where the combination of endodontics, apical surgery, and tissue regeneration yielded high success rates. Integrating these procedures into an interdisciplinary protocol is essential to optimize prognosis in young patients.[3,11,12]

CONCLUSIONS

External root resorption may be a physiological or pathological process involving the loss of dentin and/or cementum, and it is sometimes associated with bone loss. In the presented clinical case, the management protocol—including endodontic treatment, apical surgery, and corrective regenerative surgery—successfully promoted bone repair and apical and periradicular healing. The efficacy of Biodentine as an osteoinductive agent was confirmed through radiographic controls, which showed significant improvement. Therefore, the protocol described in this study is recommended to achieve favorable clinical outcomes in the management of external root resorption.

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