Clinical Update

External Cervical Resorption

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Introduction
The American Association of Endodontists defines resorption as a condition associated with either a physiologic or a pathologic process resulting in a loss of dentin, cementum, and/or bone. External resorption is initiated in the periodontium and affects the external surface of a tooth. Cervical resorption (often referred to as invasive or external cervical resorption) is a type of external resorption that occurs in the coronal third of the root. This type of resorption can often be confused with not only internal resorption, but also with caries. The purpose of this Clinical Update is to review the etiology, classification, clinical and radiographic presentation, and treatment options as they relate to external cervical resorption (ECR).

Resorption Mechanism and Etiology
The mechanism of tooth resorption is similar to bone resorption, where osteoclastic activity causes resorption of hard tissue through the production of acidic by-products. These elastic, or tooth-resorbing, cells (sometimes referred to as odontoclasts) may be the same cells as osteoclasts but their true nature is unknown. Likewise, the exact cause of cervical resorption is not well understood, but several predisposing factors have been identified, whether alone or in combination: prior orthodontic treatment, dentoalveolar trauma, intracoronal bleaching, dental surgery primarily involving the cementoenamel junction (CEJ), and periodontal scaling and root planning. Orthodontic treatment and dentoalveolar trauma have been identified as the most common predisposing factors.

Classification
Dr. Geoffrey S. Heithersay developed a classification system for cervical resorption that is based on the infiltrative extent of the lesion along the root (Fig. 1). This system provides a clinical guide in the assessment of cervical resorption.

**Figure 1** Cervical resorption classification

**Class 1** – small lesion near the cervical area with shallow penetration into dentin.

**Class 2** – well-defined lesion that penetrates close to the coronal pulp but shows little or no extension into the radicular dentin.

**Class 3** – lesion showing deeper invasion of dentin that extends into the coronal third of the root.

**Class 4** – large lesion that extends beyond the coronal third of the root.

Radiographic Presentation
Internal and external resorption are often confused radiographically. When using two-dimensional radiography, it is important to capture images from two different angles and apply the buccal object rule. Periapical radiographs can provide a strong indication whether the resorptive lesion is internal or external. Internal resorptive lesions typically exhibit symmetry within the canal compared to external lesions which are asymmetrical (Fig. 2). As mentioned previously, often the pulpal tissue is unaffected by the resorptive process in ECR; as a result, the outline of the pulp canal space can be visualized through the radiolucent resorptive lesion. ECR is also mistaken for caries radiographically. As demonstrated in Figure 3, caries typically presents at or just apical to the contact with adjacent teeth, whereas ECR originates at or near the CEJ. ECR tends to leave the external tooth surface intact, while caries tends to destroy the external surface. These radiographic considerations, coupled with clinical findings, lend strong credibility to a diagnosis of ECR. However, the use of three dimensional, limited field of view cone beam computed tomography (LFOV CBCT) can be a useful diagnostic and treatment planning aid. In fact, LFOV CBCT has demonstrated the ability to increase the diagnostic information to better classify ECR when compared to two-dimensional radiographs.

**Figure 2** Radiographic difference between ECR (left) and internal resorption (right).

**Figure 3** Radiographic difference between ECR (left) and caries (right).

Clinical Presentation
As the name suggests, ECR initiates in the cervical area of the tooth, usually apical to the epithelial attachment. The resorptive lesion contains well-vascularized granulation (or fibrovascular) tissue that may be visible through unaffected, translucent enamel if the process reaches the supragingival portion of the crown. This can give the lesion its characteristic pink discoloration which can help the clinician distinguish a resorptive lesion from caries. Additionally, probing the lesion can induce bleeding and the walls of the lesion may feel hard and mineralized. The borders of the cavity may also be thin and knife-edged. Likewise, if the lesion is more apically positioned, it may be detected by deep periodontal probing. Bleeding on probing is likely to occur and the pocket may have a spongy feel. Often, ECR is asymptomatic and is usually an incidental finding during routine examination. However, determining the pulpal status is important before initiating treatment due to the close proximity of the resorptive lesion to the pulp. It is common for the pulp to remain vital and a recent study suggests the pulp reacts to the resorptive process through calcification of the extracellular matrix.

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Non-Surgical (Restorative) Treatment of Resorptive Defects

Class 1 or Class 2 ECR lesions coronal to the epithelial attachment are possible candidates for removal of the resorptive lesion, followed by an appropriate restoration. The aim should be to remove all affected tissue within the lesion and arrest the resorptive process. Tissue removal can be completed with a slow-speed round bur or curette, taking special care not to expose the pulp. If a pulp exposure occurs, non-surgical root canal treatment may be indicated. Early restorative techniques included the application of trichloracetic acid (TCA) to the lesion before curettage to induce coagulation necrosis, followed by a glass ionomer restoration. More recent techniques include the placement of glass ionomers or resin-modified glass ionomer restorations or a bioresorbable material such as mineral trioxide aggregate (MTA) or Biodentine™. One restorative technique advocates the use of a combined (or sandwich) technique using MTA at the most pulpal extent of the preparation, followed by a glass ionomer then a light-cured composite restoration. The most important factor when choosing a restorative material is to select one that will provide an adequate seal and will be biocompatible with the periodontium.

Surgical Treatment of Resorptive Defects

When access to the resorptive lesion is not possible due to the position or extent of the resorptive defect, a surgical approach may be indicated. A mucoperiosteal flap is reflected to gain access to the defect and lesion excavation with a slow-speed round bur or curette is performed as previously described. Due to the location of the lesion in the cervical third of the root, a biocompatible restorative material should be used to promote the possibility of bone regeneration and periodontal reattachment. The biocompatibility and bioactivity of MTA have been confirmed through numerous studies. Products such as Geristore™ and EndoSequence Root Repair Material™ have demonstrated similar biocompatible and bioactive characteristics. Alternative treatment options may include an apically positioned flap apical to the defect, orthodontic extrusion, or extraction with intentional replantation. Regardless of the technique indicated, surgical treatment of ECR should be referred to an endodontist or an experienced surgical provider.

Cases Requiring Root Canal Treatment

Some ECR cases may require non-surgical root canal treatment in conjunction with removal of the resorptive lesion. This treatment is necessary when the pulpal diagnosis indicates endodontic treatment, or if perforation of the root canal wall occurs during removal of the resorptive lesion. When this combination therapy is used, initial root canal instrumentation should be performed with saline as the irrigant. A gutta-percha cone or other suitable material should be placed to maintain canal patency until the resorptive defect is restored. After the defect is restored, the root canal system can be appropriately treated under dental dam isolation without the risk of expressing harmful irrigants or obturation material into the periodontium.

Prognosis

The prognosis of ECR cases depends on the location and extent of the resorptive lesion. Success rates have been reported at 100% for Class 1 and Class 2 lesions, 77.8% for Class 3 lesions, and 12.5% for Class 4 lesions when treated properly. When managing Class 3 & 4 lesions, all treatment options should be discussed with the patient prior to developing a treatment plan.

Conclusions

Proper treatment of ECR is dependent on proper diagnosis. Endodontic providers should be consulted when ECR cases are identified. This Clinical Update provides a strong, evidence-based approach that should aid the clinician in identifying, managing and treating these types of cases.

References

1. AAE Glossary of Endodontic Terms (copyright 2015 AAE).

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