Endodontic and periodontal treatment of external cervical root resorption: a case report

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ABSTRACT

External cervical root resorption (ECRR) is the loss of dental hard tissue as a result of odontoclastic action. It usually begins on the cervical region of the root surface of teeth. Lesions are frequently misdiagnosed and confused with caries and internal resorption. As a result, inappropriate treatment is often initiated. Early diagnosis and appropriate treatment are the keys to a successful outcome. The etiology of ECRR is mainly trauma, orthodontic treatment or idiopathic factors. The aim of this study is to describe a combined surgical-periodontal-endodontic-restorative treatment of an external cervical resorption Heithersay Class III case with ECRR of idiopathic nature on tooth #43. Treatment was combined: surgical-periodontal treatment exposed the resorptive defect, followed by surgical removal of inflammatory tissue, restorative treatment using resin-modified glass ionomer cement and endodontic therapy because of the necrotic pulp. After 12 months of clinical and radiographic control, recurrence of resorptive lesion was non-existent.

Keywords: Endodontics. Root resorption. Case reports.

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Introduction

Root resorption is the loss of dental hard tissue (cementum and dentin) as a result of odontoclastic action.[18] It is physiological and desirable when associated with primary teeth, as it results in exfoliation, thereby allowing eruption of permanent successors.[19] However, root resorption of permanent teeth is usually unfavorable and might result in irreversible damage and/or eventual tooth loss.

External cervical root resorption (ECRR) often occurs under the junctional epithelium at the cervical portion of the affected tooth.[2,11,18] The etiology is still unknown. It is known that cementum works protecting the root dentin against resorption, so that when the cementum layer is destroyed or interrupted, the root surface is exposed to clastic cells which are responsible for root resorption.[8] Anatomical aspects of the cementum-enamel junction may influence the appearance of ECRR. Defects on the cementum layer may expose the cervical dentin, making it vulnerable to resorption.[8] However, other factors seem to induce the appearance of these lesions, for instance, dental trauma, orthodontic treatment, coronal bleaching, and idiopathic factors.[12]

ECRR is a recognized complication of luxation and avulsion injuries.[12] These traumas can be underestimated, as patients oftentimes do not remember episodes of this nature. Nevertheless, dental trauma is the main predisposing factor of ECRR, accounting for approximately 15% of cases.[12] This value increases to 25.7% when other contributory factors (for example, intracoronal bleaching and orthodontic treatment) are included.[12]

Excessive loading during orthodontic treatment may result in tissue necrosis adjacent to the exposed root dentin. This might result in mononuclear precursor cells being stimulated to differentiate into odontoclasts which are attracted to the exposed root dentin and stimulated to resorb it.[12] Intracoronal bleaching also may contribute for ECRR appearance. The pH at the root surface of teeth is reduced to about 6.5 by intracoronal placement of a ''walking bleach'' paste; the slightly acid environment is responsible for increasing clastic activity, causing resorptive lesions.[17] Moreover, cementum defects at the cementum-enamel junction could result in hydrogen peroxide escaping from the pulp chamber of root-filled teeth to the external root surface via dentinal tubules, which leads to dentin denaturation, in addition to triggering an immune response.[20] Heithersay[11] observed that approximately 15% of patients with ECRR did not have any predisposing factor. The author attributed no apparent causes for the appearance of these lesions, classifying them as idiopathic.

Histologically, ECRRs are resorptive cavities filled with granulation tissue. Osteoclasts can be found in the region adjacent to hard tissue not yet reabsorbed.[19] The pulp tissue has normal characteristics due the predentin layer which protects it.[2]

Clinically, ECRRs are detectable by routine radiographic examination, since patients do not report symptomatology. Incipient lesions are more easily diagnosed when they affect proximal surfaces. Radiographically, ECRR presents asymmetrical radiolucency with irregular margins. Root canal contour is usually intact, indicating that the lesion is associated with the external root surface. In advanced cases, the lesion tends to spread into the root in all directions.[19] To differentiate external from internal root resorption and check for the continuity of the root canal, radiographs must be taken with different horizontal angles. Radiographs taken at different horizontal angles will show the defect centralized at the root canal when the lesion is caused by internal resorption; while in cases of external root resorption, the defect will move according the incidence of the X-ray. If the defect is at the palatal or lingual aspect of the root, it will move accompanying the cylinder position; if the defect is at the buccal aspect, it will move in the opposite direction.[18] Incipient cases can also be diagnosed by means of cone-beam computed tomography. Tridimensional images reveal incipient lesions located in the bucco-palatal axis and cavities superimposed on other structures.

ECRR might sometimes be associated with periodontal inflammation due to the presence of a periodontal pocket.[16] Cases in which resorption reaches the tooth crown, the cervical coronary portion presents with a light pink coloration due to significant vascularization of the affected tissue, the thin dentin layer and enamel translucency.[11] Clinically, these cases can be confused with internal resorption; radiographic examination eliminates the doubt. Similarly, it is important to have the differential diagnosis

between ECRR and cervical caries in mind. The latter presents a softened aspect under probing, while the former presents hard tissue resistant to probing.[18] Teeth with external cervical resorption normally test positive to pulp sensitivity tests.[19]

Thus, the aim of this study is to describe a combined surgical-periodontal-endodontic-restorative treatment of an external cervical resorption Heithersay Class III case.

Case report

A healthy 56-year-old male patient presented for consultation at the Dentistry Division of Universidade Federal do Rio Grande do Sul for dental prophylaxis. Patient's medical history was noncontributory. During periodontal examination, a subgingival cavity was found in tooth #43 lingually. The cavity was sealed with a temporary restorative material (Coltosol; Vigodent, Bonsucesso, RJ, Brazil). The radiographic scan (Fig 1) showed a radiolucent lesion in the cervical area of the tooth. The patient reported no history of trauma or injury associated to this tooth.

Figure 1. Periapical radiograph of the mandibular right canine. Note the resorptive defect sealed provisionally.

After clinical examination and sensitivity tests, a diagnosis of pulp necrosis was reached. The tooth presented regular coloration, absence of pain at vertical or horizontal percussion, and no periodontal inflammation. Based on the extension, depth and characteristics of the lesion, the diagnosis was of external cervical root resorption idiopathic in nature. The patient was informed about the diagnosis, treatment plan and prognosis of the case.

The first procedure was a surgical-periodontal intervention aimed at exposing the resorptive defect and allowing access for cavity sealing and subsequent endodontic treatment. A full-thickness flap was raised in the lingual aspect to access the resorptive area (Fig 2). The incision was performed 4 mm distal from tooth #43 and involved teeth #43, 42 and 41. It was straight along the edentulous ridge and intrasulcular in edentulous areas, both bucally and lingually. Curettage of granulation tissue was performed with removal of the superficial dentin layer and by means of a round bur. To allow clear delimitation of the ECRR, osteotomy was performed at the lingual and distolingual aspect. Thereafter, communication between the pulp cavity and ECRR was noted. This way, a #60 gutta-percha cone was inserted into the root canal to avoid overflow of the restorative material (Fig 3).

For restoration, light-cured resin-modified glass ionomer cement (Vitremer; 3M ESPE, St. Paul, Minnesota, USA) was used. Due care was taken to keep the restoration smooth and polished. Subsequently, the tissue flap was repositioned and sutured with no absorbable sterile surgical sutures (Sofsilk 4-0, Covidien, Mansfield, MA, USA).

Analgesic drugs and 0.12% chlorhexidine mouthwash were prescribed for 48 hours and twice a day, respectively, for 14 days. The patient was advise to take cold, liquid or pasty feeding during the first 24 hours and avoid physical effort for five days. The sutures were removed after one week and it was decided for maintenance of chemical control (1% chlorhexidine gel for 21 days), associated with mechanical brushing in the surgical area.

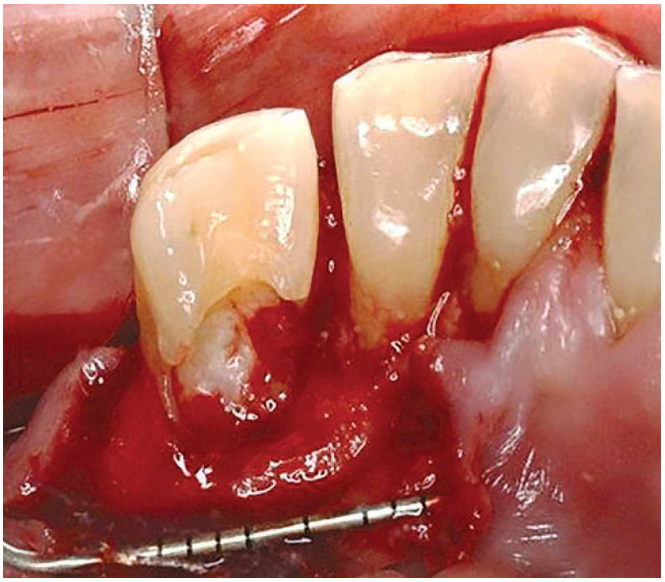

Figure 2. Full-thickness mucoperiosteal flap in the lingual aspect.

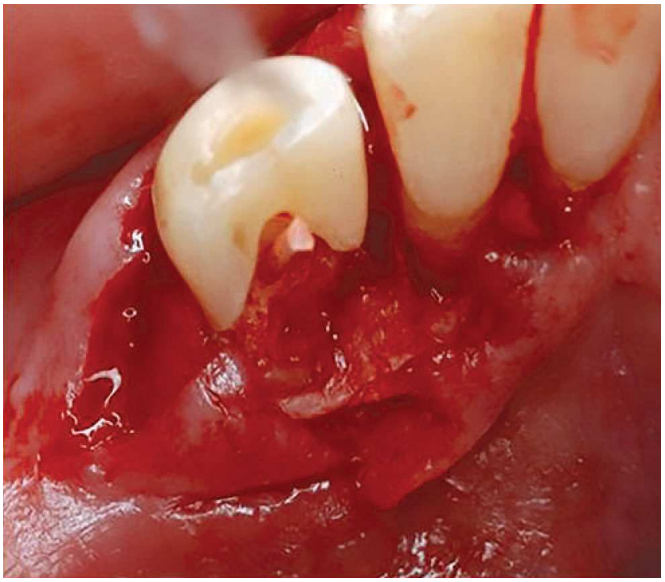

Figure 3. Curettage of granulation tissue and insertion of a gutta-percha cone into the root canal to avoid overflow of the restorative material.

After 15 days, endodontic treatment was initiated. Rubber dam was positioned and crown opening was performed with the aid of a diamond bur 1014 (KG Sorensen, Cotia, SP, Brazil). The root canal was located and working length established (24 mm). Cleaning and shaping procedures were carried out up to a #35 K-file. At each change of instrument, the canal was irrigated with 2 mL of 2.5% NaOCl (Farmácia Calêndula, Porto Alegre, RS, Brazil), with the aid of a plastic syringe (Ultradent Inc., South Jordan, UT, USA) and Endo-Eze Tips (Ultradent Inc., South Jordan, UT, USA), followed by aspiration with proper tips (Ultradent Inc., South Jordan, UT, USA). Smear layer removal was performed by one final irrigation with 3 mL of 17% EDTA (Farmácia Calêndula, Porto Alegre, RS, Brazil), followed by 2 mL of 2.5% NaOCl for three minutes. The root canal was dried with paper cones (Tanari, Manacaparu/AM, Brazil), and calcium hydroxide paste was used as root canal dressing (Calen PMCC - SS White, Rio de Janeiro, RJ, Brazil). Coronal sealing was performed with a temporary material (Coltosol; Coltene-Whaledent, Cuyahoga Falls, OH, USA).

Two weeks later, rubber dam was placed, coronal sealing and root canal dressing were removed. The root canal was irrigated with 10 mL of 2.5% NaOCl and 5 mL of 17% EDTA. Final irrigation was performed with 5 mL of 2.5% NaOCl. Then, a #35 gutta-percha cone (Dentsply, Petrópolis, RJ, Brazil) was selected. A gutta-percha master cone and accessory cones associated with an epoxy resin-based sealer (AH Plus; Dentsply, Petrópolis, RJ, Brazil) were used to fill the canal. Crown opening was sealed with a layer of gutta-percha and light-cured glass ionomer cement (Vidrion R; SS White, Rio de Janeiro, RJ, Brazil), followed by final radiograph taking (Fig 4).

Clinical and radiographic control was performed after three, six and 12 months. After one year, the tooth remained asymptomatic, with no clinical or radiographic signs of resorption. Treatment was considered to be both esthetically and functionally successful.

Discussion

In most cases, cervical root resorption is detected during routine radiographic or clinical examination. The use of varying horizontal X-ray angles has been suggested to distinguish the surface affected by ECRR, in spite of not representing the resorptive defect tridimensionally.[2] The location of ECRR interferes in the radiographic view, once buccal or lingual defects are harder to be detected or lead to a misinterpretation

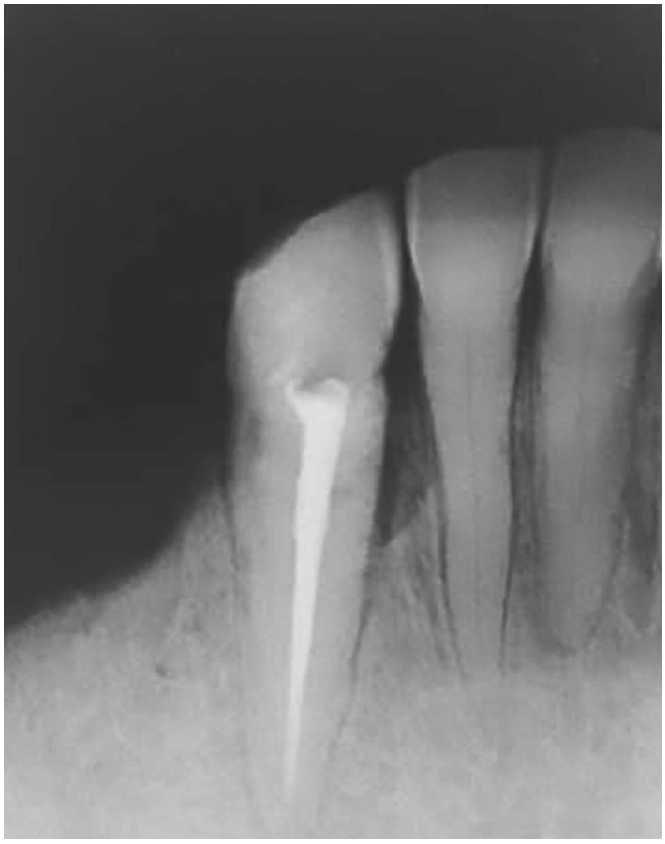

Figure 4. Periapical radiograph after endodontic treatment.

of diagnosis, confusing it with internal resorption. On the other hand, defects located in interproximal areas are more easily detectable.[9]

After anamnesis, clinical and radiographic examinations, the case reported herein was diagnosed as external cervical root resorption Heithersay Class III associated with pulp necrosis.[13] The differential diagnosis that distinguishes it from root decay was given by probing which detected hard dentin tissue and communication with the pulp cavity. Patient's satisfactory oral health associated with a low sugar diet and absence of removable prosthesis, which could be responsible for mechanical injury over the cervical portion of the tooth, contributed to making the diagnosis.

Due to the presence of a cavity, its location and pulp necrosis, treatment was based on surgical, restorative and endodontic procedures. Many times, endodontic treatment is necessary because there is communication between the cavity and the root canal, particularly due to the bacterial contamination via resorptive defect.[5]

Surgical access aimed to remove the granulation tissue and allow restoration of the root defect. Crown opening, root canal location and obliteration with a gutta-percha cone were procedures carried out during surgery. This way, restoration of the root defect was performed with minimal possibilities of glass ionomer overflow into the root canal.[13,19] On the other hand, sealing of the resorptive defect prevented NaOCl, endodontic sealer and gutta-percha overflow into the adjacent periodontium during endodontic treatment.

Several types of material are used to restore root defects, such as mineral trioxide aggregate (MTA), amalgam and composite resin.[6] In this case report, once granulation tissue had been removed, resin-modified glass ionomer was used due to being well accepted by periodontal tissues and presenting low toxicity, appropriate adhesion to dentin and satisfactory esthetics.[1] Moreover, when in contact with periodontal tissues, resin-modified glass ionomer induces healing by interposition of connective tissues.[10]

The conditions for subgingival restoration were given by the mucoperiosteal flap and minimal osteotomy, which allowed access to cavity restoration. Restoration was performed without reestablishment of periodontium biological width. This decision was based on clinical studies that used glass ionomer to restore subgingival root defects and presented successful clinical outcomes.[3,14,16]

Subgingival restorations have always been associated with focal periodontal inflammation.[4,21,22] This phenomenon occurs due to roughness of the material used for this purpose and poor marginal adaptation and contour of the restoration. However, it is well known that bacteria play an important role in the development of subgingival inflammation adjacent to restorations.[23]

It can be postulated that the location of the restoration margin plays a secondary role in periodontal inflammation if the tooth-restoration interface presents correct contour, adaptation,and smoothness.[15] Studies on implants can properly illustrate this idea because they show that healthy and stable peri-implantar tissues can be found even in cases when the implant-abutment connection is located under the bone level.[7,24] It is essential to emphasize that the reported condition of healthy peri-implantar tissues results from systematic and thorough oral hygiene performed by the patient[18] and the unique characteristics of the implant-abutment

connection with minimal marginal distortion and surface smoothness.[19] In cases of direct restoration or prosthetic crowns, the more subgingival the cavity margin is located, the greater the difficulty obtaining a biocompatible tooth-restoration transitional zone, with a smooth surface, adequate contour and adaptation. In this case report, mucoperiosteal flap and osteotomy were performed to allow adequate restoration of the root defect.

Poor restoration techniques and inadequate selection of restorative material favor plaque buildup on the restoration margins. In this case report, the choice for resin-modified glass ionomer cement was based on the lower inflammatory response by periodontal tissues when this material is used.[10] Gingival fibroblasts present greater biocompatibility to glass ionomer cement than silver amalgam, for example.[1] Such cases present success rates around 78%.[19]

Thus, it seems clear the importance of informing the patient about potential complications arising from the proposed treatment, such as the increased risk of root fracture due to tooth weakening. In the case reported herein, the patient chose to maintain the tooth and accepted the proposed treatment plan.

Clinical and radiographic follow-ups of ECRR cases are indispensable to assess treatment success. After one year, the tooth was asymptomatic, with absence of mobility, periodontal pockets and bleeding on probing. Moreover, patient's gingiva was healthy and normal in color and texture.

Conclusion

Early diagnosis is critical to clinical and radiographic success of treatment of injuries caused by resorption. The relatively low risk of developing ECRR does not justify additional radiographic examination; however, any radiographic investigation performed for general examination should serve, routinely, to search resorption lesions, especially if the teeth in question have been exposed to one or more of the predisposing factors.

In the present case report, after surgical treatment associated with cavity restoration by means of resin-modified ionomer glass cement and endodontic treatment, ECRR ceased and periodontal tissues healed after one year.

References

1. Al-Sabek F, Shostad S, Kirkwood KL. Preferential attachment of human gingival fibroblasts to the resin ionomer Geristore. J Endod. 2005 Mar;31(3):205-8.
2. Bergmans L, van Cleynenbreugel J, Verbeken E, Wevers M, van Meerbeek B, Lambrechts P. Cervical external root resorption in vital teeth. J Clin Periodontol. 2002 Jun;29(6):580-5.
3. Dragoo MR Resin-ionomer and hybrid-ionomer cements: part II, human clinical and histologic wound healing responses in specific periodontal lesions. Int J Periodontics Restorative Dent. 1997 Feb;17(1):75-87.
4. Eid M. Relationship between overhanging amalgam restorations and periodontal disease. Quintessence Int. 1987 Nov;18(11):775-81.
5. Estevez R, Aranguren J, Escorial A, de Gregorio C, De La Torre F, Vera J, et al. Invasive cervical resorption Class III in a maxillary central incisor: diagnosis and follow-up by means of cone-beam computed tomography. J Endod. 2010 Dec;36(12):2012-4.
6. Frank AL, Torabinejad M. Diagnosis and treatment of external invasive resorption. J Endod. 1998 Jul;24(7):500-4.
7. Giannopoulou C, Bernard JP, Buser D, Carrel A, Belser U. Effect of intracrevicular restoration margins on peri-implant health: clinical, biochemical, and microbiologic findings around esthetic implants up to 9 years. Int J Oral Maxillofac Implants. 2003 Mar-Apr;18(2):173-81.
8. Gold SI, Hasselgren G. Peripheral inflammatory root resorption. A review of the literature with case reports. J Clin Periodontol. 1992 Sep;19(8):523-34.
9. Goldberg F, De Silvio A, Dreyer C. Radiographic assessment of simulated external root resorption cavities in maxillary incisors. Endod Dent Traumatol. 1998 Jun;14(3):133-6.
10. Gomes SC, Miranda LA, Soares I, Oppermann RV. Clinical and histologic evaluation of the periodontal response to restorative procedures in the dog. Int J Periodontics Restorative Dent. 2005 Feb;25(1):39-47.
11. Heithersay GS. Clinical, radiologic, and histopathologic features of invasive cervical resorption. Quintessence Int. 1999 Jan;30(1):27-37.
12. Heithersay GS. Invasive cervical resorption: an analysis of potential predisposing factors. Quintessence Int. 1999 Feb;30(2):83-95.
13. Heithersay GS. Invasive cervical resorption. Endod Top. 2004 Mar;7(1):73-92.
14. Hommez GM, Browaeys HA, De Moor RJ. Surgical root restoration after external inflammatory root resorption: a case report. J Endod. 2006 Aug;32(8):798-801.
15. Jansson L, Blomster S, Forsgårdh A, Bergman E, Berglund E, Foss L, et al. Interactory effect between marginal plaque and subgingival proximal restorations on periodontal pocket depth. Swed Dent J. 1997;21(3):77-83.
16. Kim SY, Yang SE. Surgical repair of external inflammatory root resorption with resin-modified glass ionomer cement. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2011 Apr;111(4):e33-6.
17. McCormick JE, Weine FS, Maggio JD. Tissue pH of developing periapical lesions in dogs. J Endod. 1983 Feb;9(2):47-51.
18. Patel S, Ford TP. Is the resorption external or internal? Dent Update. 2007 May;34(4):218-20, 222, 224-6, 229.
19. Patel S, Kanagasingam S, Pitt Ford T. External cervical resorption: a review. J Endod. 2009 May;35(5):616-25.
20. Rotstein I, Torek Y, Misgav R. Effect of cementum defects on radicular penetration of 30% H_2O_2 during intracoronal bleaching. J Endod. 1991 May;17(5):230-3.
21. Valderhaug J, Heloe LA. Oral hygiene in a group of supervised patients with fixed prostheses. J Periodontol. 1977 Apr;48(4):221-4.
22. Valderhaug J. Periodontal conditions and carious lesions following the insertion of fixed prostheses: a 10-year follow-up study. Int Dent J. 1980 Dec;30(4):296-304.
23. Waerhaug J. Effect of rough surfaces upon gingival tissue. J Dent Res. 1956 Apr;35(2):323-5.
24. Walton T. On inconvenient truths. Int J Prosthodont. 2011 May-Jun;24(3):244-6.