Case report

Endodontic and surgical management of invasive cervical resorption: Literature review and case report

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ABSTRACT

Background: Invasive cervical resorption (ICR) is a type of external root resorption, characterised by the loss of hard dental tissue by the action of odontoclasts. It appears most often in the cervical region of the root surface of the teeth.

Objective: To present a case report describing the protocol for dealing with an invasive cervical resorption, and literature review of the etiology, diagnosis and treatment.

Case report: Female patient, 19 years old, with no relevant medical history, who came to our clinic due to a pinkish colouration in the cervico-buccal surface of the right maxillary central incisor.

The tooth had no pain on percussion and palpation. The vitality of the tooth was negative. After rigorous analysis, treatment was performed which consisted of 2 phases: Firstly, a nonsurgical phase followed by a surgical procedure. The reconstruction of the defect was carried out using glass ionomer cement.

Conclusions: The endodontist needs to understand and manage the periodontal and restorative aspects of treating ICR. After treatment, the patient was satisfied with the aesthetic result.

KEYWORDS

External root resorption; Invasive cervical resorption.

BACKGROUND

Root resorption is the loss of dental hard tissue as a result of clastic activity. Reabsorption can be classified as internal or external according to its location relative to the root surface. Internal resorption occurs within the pulp canal, and tends to be asymptomatic; it is usually caused by a chronic infection or trauma[1]. Internal resorption is classified into surface, inflammatory and replacement resorption. While external root resorption can be divided into progressive inflammatory, cervical and replacement resorption.

Invasive cervical resorption (ICR) is a clinical term used to describe a rare form of external root resorption[2].

It is seen in most cases as a late complication of traumatic injuries to the teeth, but may also occur following orthodontic movements, periodontal treatments, whitening and reimplantation. In addition, there is literature supporting unknown etiology of ICR[3].

Clinical presentation of ICR varies considerably. Lesions can be identified during a routine conventional radiography (radiolucent area) or by performing a clinical examination, as in most cases it is asymptomatic. Cone Beam Computed Tomography (CBCT) is useful for the diagnosis and management of ICR, as the true extent of the defect cannot always be estimated by conventional radiography[4].

It is characterised by a progressive loss of cementum and dentine with replacement by fibrovascular tissue derived from periodontal ligament.

In early lesions, an irregularity can be seen in the gingival contour. In advanced lesions, the crown shows a pink colour, mimicking internal resorption[5]. This discoloration is due to vascular granulation tissue that shows through the thin residual enamel.

Heithersay[2,6-8] wrote what are now classic articles in the literature describing the features, possible predisposing factors and recommendations for treating ICR. He divided ICR into 4 categories depending on the degree of affectation of the mineral tissue.

- Class 1: Small resorption area located in the cervical zone with dentin surface penetration.
- Class 2: Well defined resorption, close to the root canal showing little or no extension to the root dentine.
- Class 3: Deep invasion into the dentine, which affects both the coronal dentine and extends into the cervical third of the root.
- Class 4: Extensive resorption which extends beyond the cervical third of the root.

For Heithersay, treatment[8] consisted of mechanical and chemical debridement of lesions followed by restoration. For class 1 and 2 lesions, he found a success rate of 100%; for Class 3 lesions, 77.8% and for class 4 lesions, a success rate of 12.5%.

Different approaches have been proposed to treat ICR. Nonsurgical treatment involves the application of 90% trichloracetic acid, curettage of the lesion, endodontic treatment, only if necessary, and restoration with glass ionomer cement[9].

Surgical treatment varies depending on the degree of ICR, and consists of lifting a mucoperiosteal flap, curettage of the lesion and restoration of the defect with composite resin[10,11], glass ionomer cement[5], ionomer cement with resin[12] or mineral trioxide aggregate (MTA)[13,14].

The aim of this article is to present a case report describing the action protocol for an invasive cervical resorption as well as a literature review of etiology, diagnosis and treatment.

CASE REPORT

Female patient, 19 years old, with no relevant medical history, who came to our clinic due to a pinkish colouration in the cervico-buccal surface of the right maxillary central incisor, 11 (Figure 1). The patient

Figure 1: Initial clinical appearance, where a pinkish colour is seen in the cervical region of the right central incisor.

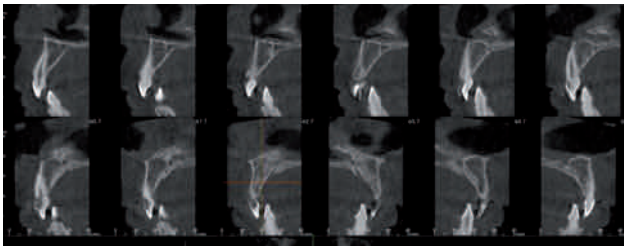

Figure 2: CBCT sagittal sections, where the resorptive extent of the lesion is seen.

had no memory of any history of trauma to the affected area.

The clinical examination showed the tooth had not been restored and there was no decay. A probe inspection detected a cavitation in the cervico-buccal surface enamel and bleeding in the area. The tooth was not painful to percussion or palpation. The vitality of this after the ethyl chloride test was negative.

Radiographic evaluation consisted of a CBCT (Figure 2) and periapical radiography, which revealed a well-defined radiolucent area in the radicular third cervical root of 11.

The diagnosis was invasive cervical resorption, Heithersay class 3, based on clinical and radiographic findings.

After studying the case, it was decided to perform treatment in two phases.

The first non-surgical phase consisted of opening and instrumentation of the root canal with manual K files to remove the necrotic pulp and disinfect the root canal. The second surgical stage was to expose and debride the resorptive defect, perform the root canal and posterior tooth restoration.

After signing the informed consent and local anaesthesia was given, the root canal was opened on the palatal face of 11. Heavy bleeding was seen, due to the link between the root canal and the resorptive defect.

The operation area covered 23 mm (Figure 3), and was determined by the apex locator Denta Port ZX (J. Morita Manufacturing) and confirmed radiographically.

The irrigation used was 1.25% sodium hypochlorite, with calcium hydroxide left as intracanal medication.

15 days later under local anaesthesia, the mucoperiosteal flap was opened to expose the entire lesion area for removal of the granulation tissue by curettes (Figure 4). Once all the granulation tissue was removed, the area was bevelled with a diamond handpiece bur.

The root canal was then irrigated with 1.25% sodium hypochlorite, before the final irrigation with 1mL of 17% EDTA and irrigation of the root canal with 1.25%

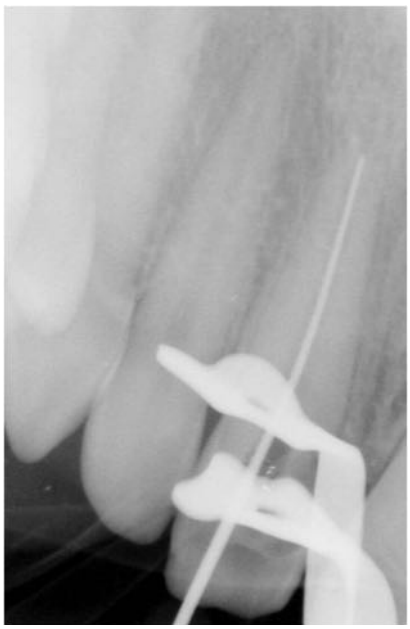

Figure 3: X-ray radiograph.

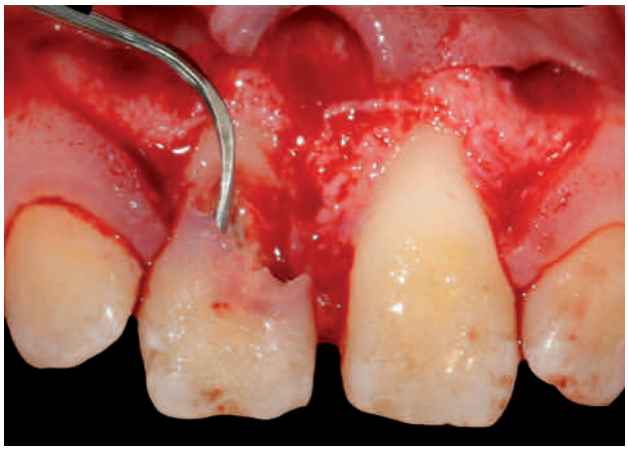

Figure 4: Intraoperative image removing granulation tissue.

Figures 5 and 6: X-ray conometry and final sealing.

sodium hypochlorite. The root canal was prepared using the Wave One® motor (Dentsply Maillefer) and Protaper® instrumentation system (Dentsply Maillefer) according to the manufacturer's instructions. The root canal was dried using paper points. The filling technique chosen was side condensation with the master cone # 50 (Figures 5 and 6). The cement used was AH plus (Dentsply). Once the root canal was finished, the resorptive defect was sealed using glass ionomer resin (EQUIA®, GC) (Figures 7, 8 and 9). After suturing the flap, the patient received post-surgical indications including a medication regimen (Augmentin 500/125mg 1/8 hours, 7 days; ibuprofen 600 mg 1/8 hours, 5 days; chlorhexidine 0.12%).

Follow-up checks were programmed at 7 (to remove stitches), 14 and 21 days (Figure 10) and 12 months (Figures 11 and 12).

DISCUSSION

Invasive cervical resorption (ICR) is an uncommon form of external root resorption, which is of interest due to the irreversible loss of the tooth structure.

In most of the studies reviewed, etiology of the ICR was not fully established. Although, trauma and orthodontic treatments top the list of factors causing this condition[15].

There was only one study published2 with a considerable number of patients with ICR. This study analysed the trigger factors in 222 patients with a total of 257 teeth undergoing different degrees of ICR. Several predisposing factors were identified, with orthodontics (24.1%) and trauma (15.1%) as the most frequent. Internal tooth whitening was a factor (9.7%) and some cases (16.4%) had no predisposing factor found.

Cement protects against root dentine resorption. It is widely accepted that there is a deficit in the protection of root cementum, as it is susceptible to colonisation by osteoclasts, which resorb the dentine[16,17]. The anatomical area most susceptible to ICR is the cementoenamel junction. Microscopic analysis of the cervical region of the teeth showed gaps in the cement, exposing the dentine and making it vulnerable to the action of osteoclasts[18].

The literature offers other theories to explain the etiology of this process. One suggested it is an inflammatory periodontal process which does not initially damage the root surface. However, after eruption of the tooth or because of gingival recession, inflammatory mediators attract resorbing cells to the root surface triggering this process[19].

However, there are counterarguments where ICR has been described as "aseptic resorptive process" which is secondarily colonised by microorganisms[9].

Von Arx[20] recently described a series of cases which shows that ICR occurs in both domestic and wild cats, where it is called Feline Odontoclastic Resorptive Lesions (FORL)[21]. Its etiology, as with ICR, is not

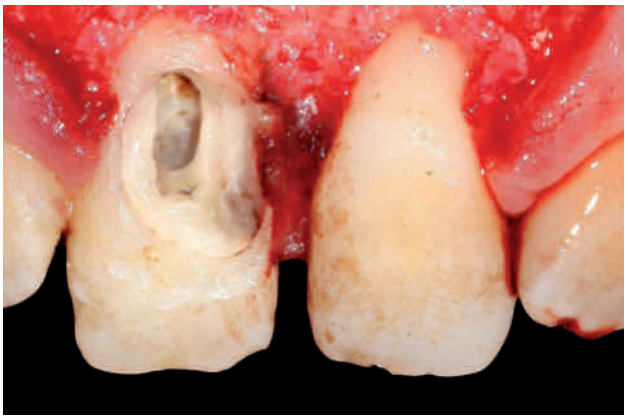

Figure 7: Situation after eliminating all granulation tissue and the cavity is prepared to receive the restorative material.

Figure 8: Restoration with glass ionomer.

Figure 9: Replacement and fixation of the flap.

entirely clear. Among the predisposing factors for FORL are stress, dietary nutrients, vomiting, irregular calcium homeostasis, viral infections, and excess vitamin D.

In all the clinical cases described by Von Arx, patients with ICR pathology had been in direct or indirect contact with cats. In addition, blood samples were taken for the neutralisation test for feline herpes simplex

Figure 10: Follow-up image after 21 days (note chlorhexidine staining).

Figure 11: Follow-up image after 1 year.

Figure 12: Pre-treatment and post-treatment images.

virus type-1 (FHV-1), indicating the transmission of the virus to humans.

To establish a good diagnosis of ICR, information

about relevant background, such as trauma, orthodontic treatment and teeth whitening is required. Clinical and radiological findings must be considered as the main criterion. In our case, the patient did not remember having any trauma or orthodontic treatment.

For clinical manifestations, the so-called “pink spot" is a sign to consider for diagnosis. Clinically, it is difficult to differentiate the pink stain due to internal dentine resorption and external cervical resorption. Traditionally, the pink spot was considered pathognomonic of internal root resorption[22]; however, these stains are common in ICR and can also be found after intrapulpal bleeding. Thus, differential diagnosis cannot be based on only observing a pink stain.

Radiographic diagnosis especially using CBCT, is an excellent tool[23]. Using CBCT, the extent of the resorptive defect detection and classification of the apical periodontitis can be assessed more accurately, as well as evaluating root anatomy and detecting root fractures, among others. In our case, we used CBCT to observe the size, shape and size of the lesion and, in particular, the vestibular-palatal anatomy of the lesion.

Finally, treatment depends on the severity, location, if the defect has perforated the root canal and the restorability of the tooth. Different treatment options are found in the scientific literature, depending on the nature of ICR and especially in isolated case reports or case series. These alternative treatments may be intentional replantation, guided tissue regeneration[24], eruption with orthodontic forces and reconstruction of the lesion (using composite resin, MTA or glass ionomer).

Treatment generally consists of removing the resorption granulation tissue and restoring the defect. Endodontic treatment may be necessary in cases where the ICR has perforated the root canal.

Heithersay[6] classified the ICR types according to the extent of the lesion. He also recommended a careful diagnosis of the case for a good prognosis, and recommended that only classes 1, 2 and 3 should be treated for defects. Class 4 defects have a high probability of failure, due to the extent of the lesion. Our case was a Class 3.

To carry out our treatment, the mucoperiosteal flap had to be lifted to provide full access to eliminate the root injury by curette.

Heithersay[8] recommended the topical application of a 90% trichloroacetic acid solution, followed by curettage and restoration with glass ionomer cement. Topical application of trichloroacetic acid produces coagulative necrosis of the tissue.

In our case, the endodontic treatment had to be performed in 2 stages. As in our case, bleeding of the pulp and granulation tissue is normally profuse and it obstructs visibility in the initial stages. We left calcium hydroxide as intracanal medication[25].

After the root canal procedure is finished and all the granulation tissue is removed, a suitable material to properly seal the defect is chosen. The materials used in the scientific literature are glass ionomer cements, MTA, amalgam and composite resin[12-14]. We decided to use reinforced high viscosity glass ionomer EQUIA Fil®(GC) to seal the defect in our case. This system does not require stratification, is condensable and not sticky. EQUIA can be used both in small, medium and large class I, II and V cavities, for both the posterior and anterior segment of the oral cavity, and in abrasions, abfractions and erosions.

CONCLUSIONS

- A correct diagnosis is of vital importance, to choose the most appropriate procedure and thereby minimise the possible consequences of poor treatment planning.

- Early detection is fundamental to a better success rate; thus, more comprehensive reviews of

patients with one or more risk factors must be done.

- ICR treatment depends on the prognosis and extent of the lesion.

- Thanks to the use of different techniques in our case, the desired results were obtained. Thus, endodontic treatment is of little use if the lesion granulation tissue is not removed properly or the restoration appearance is managed poorly.

BIBLIOGRAPHY

1. Kamburoglu K, Kursun S, Yuksel S, Oztas B. Observer ability to detect ex vivo simulated internal or external cervical root resorption. J Endod 2011; (37) 2:168-75.
2. Heithersay GS. Invasive cervical resorption: an analysis of potential predisposing factors. Quintessence Int 1999;30:83-95.
3. Moody GH, Muir KF. Multiple idiopathic root resorption. A case report and discussion of pathogenesis. J Clin Periodontol 1991;18:577–80.
4. Patel S, Dawood A. The use of cone beam computed tomography in the management of external cervical resorption lesions. Int Endod J 2007;40:730–7.
5. Hiremath H, Yakub SS, Metgud S, Bhagwat SV, Kulkarni S. Invasive cervical resorption: a case report. J Endod 2007;33:999–1003.
6. Heithersay GS. Clinical, radiologic and histopathologic features of invasive cervical resorption. Quintessence Int 1999;30:27–37.
7. Heithersay GS. Invasive cervical resorption following trauma. Aust Endod J 1999;25: 79–85.
8. Heithersay GS. Treatment of invasive cervical resorption: an analysis of results using topical application of trichloroacetic acid, curettage and restoration. Quintessence Int 1999;30:96–110.
9. Heithersay GS. Invasive cervical resorption. Endod Top 2004;7:73–92.
10. Roig M, Morelló S, Mercadé M, et al. Invasive cervical resorption: report on two cases. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2010;110:64–9.
11. Schwartz RS, Robbins JW, Rindler E. Management of invasive cervical resorption: observations from three private practices and a report of three cases. J Endod 2010;36:1721–30.
12. Estevez R, Aranguren J, Escorial A, 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;36:2012–4.
13. Pace R, Giuliani V, Pagavino G. Mineral trioxide aggregate in the treatment of external invasive resorption: a case report. Int Endod J 2008;41:258–66.
14. Yilmaz HG, Kalender A, Cengiz E. Use of mineral trioxide aggregate in the treatment of invasive cervical resorption: a case report. J Endod 2010;36:160–3
15. Trope M. Root resorption of dental and traumatic origin: classification based on etiology. Pract Periodontics Aesthet Dent 1998;10:515-22.
16. Trope M. Root resorption due to dental trauma. Endod Topics 2002;1:79–100.
17. Hammarstrom L, Lindskog S. Factors regulating and modifying dental root resorption. Proc Finn Dent Soc 1992;88(Suppl 1):115–23.
18. Neuvald L, Consolaro A. Cementoenamel junction: microscopic analysis and external cervical resorption. J Endod 2000;26:503–8.
19. Gunraj MN. Dental root resorption. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1999;88:647–53.
20. Thomas Von Arx, Peter Schawalder. Human and Feline invasive cervical resorptions: the missing link? Presentation of four cases. J Endod 2009;35:904-913.
21. Berger M, Schawalder P, Stich H, Lussi A. Feline dental resorptive lesions in captive and wild leopards and lions. J Vet Dent 1996;13:13–21.
22. Patel S, Ricucci D, Durak C,Tay F. Internal root resorption: a review. J Endod 2010;36:1107-1121.
23. Estrela C, Bueno M, Gonc¸ alves De Alencar A, et al. Method to evaluate inflammatory root resorption by using cone beam computed tomography. J Endod 2009;35:1491–7.
24. Rankow HJ, Krasner PR. Endodontic applications of guided tissue regeneration in endodontic surgery. Oral Health 1996;86:33–5.
25. Turkun M, Cengiz T. The effects of sodium hypochlorite and calcium hydroxide on tissue dissolution and root canal cleanliness. Int Endod J 1997;30:335-342.