



Invasive Cervical Resorption: Etiology, Diagnosis, Classification and Treatment

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ABSTRACT

Background: Invasive cervical resorption (ICR) is not well understood by the professional, being misdiagnosed, leading to inappropriate treatment and unnecessary loss of tooth.

Introduction: ICR is defined as a localized process of resorption, which begins in the cervical area of the tooth, just below the epithelial junction and above the ridge crest in the area of the connective tissue insertion. Possible predisposing factors include external trauma, orthodontic movement, surgical procedures, periodontal disease and its treatments, endogenous bleaching, pressure generated by wind instruments and herpes virus infection. Different approaches have been suggested for the treatment of ICR, depending on the extent of the lesion and its location. However, in some cases due to the severity of the injury, there is no alternative but to tooth extraction, followed by restoration of the edentulous area.

Aim and objective: Discuss etiology, diagnosis and classification of the ICR, as well as different treatment options. Also is presented a case in which extraction was carried out, installation of the implant and ceramic crown, subsequent to a treatment approach that resulted in failure in the short-term period.

Conclusion: Early diagnosis of the ICR is critical to proper treatment and favorable prognosis. Interdisciplinary treatment should be instituted as soon as possible, avoiding the loss of the affected tooth. In advanced cases, treatment involving the installation of osseointegrated implants should be considered the first choice of treatment.

Clinical significance: Early diagnosis of the ICR is critical to prevent unnecessary tooth loss, once the prognosis for advanced cases is doubtful.

Keywords: Root resorption, Invasive cervical resorption, Dental implants.

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INTRODUCTION

Invasive cervical resorption (ICR) is defined as a localized process of resorption, which begins in the cervical area of the tooth, just below the epithelial junction and above the ridge crest in the area of the connective tissue insertion.^{1,2} It is a relatively rare form of root resorption, characterized by progressive loss of cementum and dentin. In many cases, only one tooth is affected.³ Often, the ICR is not well understood by the professional, being misdiagnosed, leading to inappropriate treatment and unnecessary loss of tooth.⁴ A basic question to be answered by the researchers is whether the absorption is merely an inflammatory process, activated by microorganisms, or a fibrovascular or fibroosseous proliferative benign disorder, with subsequent contamination by nonpathogenic microorganisms.²

Possible predisposing factors include external trauma⁴⁻⁶ orthodontic movement,^{7,8} surgical procedures^{1,6} periodontal disease and its treatments⁹ and endogenous bleaching.¹⁰⁻¹⁴ Gunst et al¹⁵ presented two cases where the pressure generated by wind instruments would be the etiological factor. The feline herpes virus has also been suggested as etiologic cofactor of root resorption in humans.¹⁶ On the other hand, many authors describe invasive cervical resorption with unknown etiology.¹⁷

Heithersay⁸ noted that orthodontic treatment was the most common risk factor identified in 47 patients (21.2%), with 62 affected teeth (24.1%). The trauma was the second most frequent factor, with 31 patients (14%) and 39 affected teeth (15.1%). The endogenous dental whitening has been identified as a possible etiological factor in 11 patients (5%) with 11 affected teeth (4.3%).

Early diagnosis and appropriate treatment are keys to success.⁴ A pink discoloration of the crown may indicate a

process of resorption, although some teeth show no visual signs of injury.^{8,9} The diagnosis is most often done by radiographs or during clinical examination, since most cases are asymptomatic. Depending on the location can be observed as an increase in probing depth.⁸ Classically, the lesions appear as an asymmetric radiolucency, with irregular margins in the cervical region of the tooth. Radiographic imaging, the incipient lesions may present radiolucent, although more advanced lesions may have a stained appearance, caused by the nature of this bone pathological change.^{2,18}

There are two types of dental resorption, internal and external. The external may occur in vital and nonvital teeth, can be classified as surface resorption, external inflammatory resorption and external cervical resorption. The ICR is a type of external inflammatory resorption.¹⁸ Heithersay^{2,8} developed a classification for ICR taking into account the degree of involvement of mineralized tissues. Class 1 corresponds to an invasive resorption characterized by low penetration in the dentin near the cervical area. Class 2 represents a well-defined lesion, close to the coronal portion of the pulp cavity with little or no extension to the root dentin. Class 3 is characterized by a deeper invasion involving coronal dentin, which extends into the coronal region of the root. Class 4 corresponds to a large invasive process of resorption reaching the middle-third of the root. Whenever an ICR is diagnosed, a multidisciplinary approach is necessary to achieve the best clinical result.¹⁹ This type of injury can lead to tooth loss, unless the correct treatment is started.⁹ Different approaches have been suggested for the treatment of ICR, depending on the extent of the lesion and its location. The nonsurgical treatment involves the topical application of aqueous solution of trichloroacetic acid to 90% in the affected area, curettage, endodontic treatment when necessary and restoration with glass ionomer cement.^{8,20} Since surgical treatment will vary depending on the affected tooth, the degree of resorption usually involves orthodontic traction²¹ and/or periodontal surgery, with or without endodontic treatment.⁴ After proper preparation, the cavity can be filled with composite resin^{4,9,19} glass ionomer cement^{2,9} resin modified by glass ionomer⁵ or mineral trioxide aggregate (MTA).^{22,23} However, in some cases due to the severity of the injury, there is no alternative but to tooth extraction, followed by restoration of the edentulous area.^{4,21}

The aim of this study was to discuss etiology, diagnosis and classification of the ICR, as well as different treatment options. Also is presented a case in which extraction was carried out, installation of the implant and ceramic crown, subsequent to a treatment approach that resulted in failure in the short-term period.

CASE REPORT

Male patient, 40 years, no history of external trauma or other etiological factor related to the ICR, sought dental care presenting two periapical radiographic images of the region of upper right canine, one before and another after a dental treatment carried out 2 years before (Figs 1 and 2). At the time external resorption was diagnosed in upper right canine with pulpal involvement, endodontic treatment was initiated, installation postreinforced with glass fibers and restoration of the lesion with composite resin in the cervical and vestibular areas and the endodontic access. The patient's main complaint was right upper canine mobility. During the clinical examination there was significant gingival inflammation in the vestibular region (Fig. 3), extensive cavitation in the lingual region that extended subgingivally, observed by probing (Fig. 4) and great tooth mobility. In a new radiography, there was extensive root resorption (Fig. 5). Because of the extent of injury, classified as class 4 at the time, it was necessary to indicate the affected tooth extraction. During surgery, it was found that the large resorption had already resulted in the separation of crown

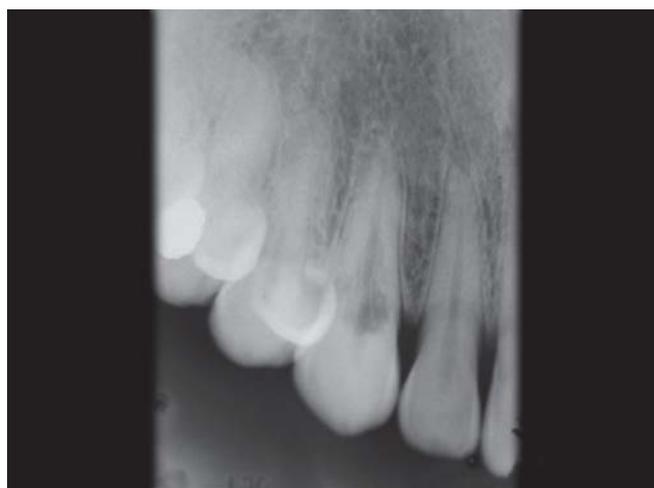


Fig. 1: Initial radiographic image of the region of upper right canine

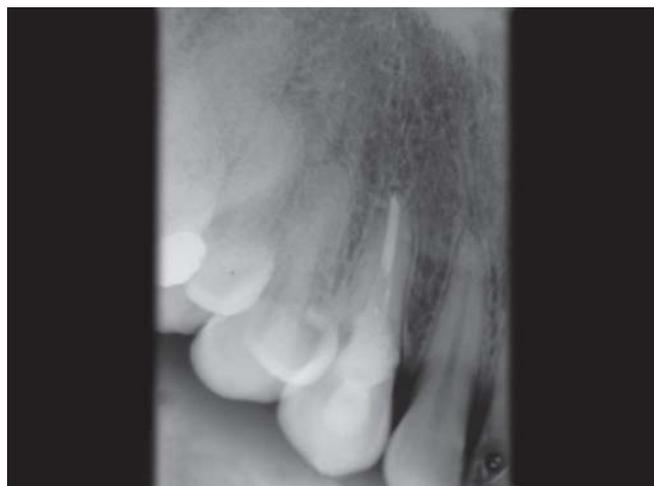


Fig. 2: Radiographic image after dental treatment

and root, and the crown was attached in soft tissue only, reason for the pronounced mobility (Fig. 6). The immediate installation of the implant was discarded because there was impairment on the part of the buccal bone plate. It was then installed a direct adhesive fixed prosthesis, using composite resin and the crown of the extracted tooth (Fig. 7). After 5 months (Fig. 8), it showed complete restoration of the

vestibular bone crest and total healing of the alveolar bone on computed tomographic (CT) scans (Fig. 9). Clinically, the region was healed and healthy (Fig. 10). A dental implant was installed in the edentulous region with primary stability of 60N and made an immediate temporary crown on the implant (Fig. 11). The occlusal contacts, both in maximum intercuspation and in excursive movements were relieved



Fig. 3: Significant gingival inflammation in the vestibular region 2 years later



Fig. 6: Crown was attached in soft tissue only, reason for the pronounced mobility



Fig. 4: Extensive cavitation in the lingual region that extended subgingivally, observed by probing



Fig. 7: Crown fixed using composite resin, after root extraction



Fig. 5: Extensive root resorption observed in a new radiography



Fig. 8: Clinical condition after 5 months

(Fig. 12). The patient was instructed to avoid chewing on the implant region. Clinical review was performed after 7 and 30 days. After 6 months, clinical examination and a new X-ray indicated the occurrence of osseointegration (Fig. 13). We then performed the making of the final crown, which involved the use of a titanium abutment obtained by CAD/CAM system and a ceramic metal-free crown (Figs 14 to 18).

DISCUSSION

An ICR is an aggressive pathological lesion which leads to loss of mineralized structure, which can cause tooth loss. Currently, its etiology is poorly understood. Several potential etiologic cofactors have been identified, such as external trauma, orthodontic movement, surgical procedures, periodontal disease and its treatments, endogenous bleaching.⁴⁻¹⁴ On the other hand, many authors describe the occurrence of lesions with unknown etiology.¹⁷ The treatment of such injuries is a major challenge for the clinician, and the literature describes several options. The classification proposed by Heithersay^{2,8} helps define the best clinical approach. In general, the treatment of defects class 1 to 3 involves cavity preparation of the affected area, preceded or not by orthodontic traction and/or periodontal procedure, followed by restoration of the cavity with any of the following types of material: Composite resin, glass ionomer or MTA. On the other hand, conservative treatments are not advisable for lesions that extend beyond the coronal third of the root (Class 4). Therefore, the interpretation of radiographic images of the reabsorption process is crucial for differential diagnosis,

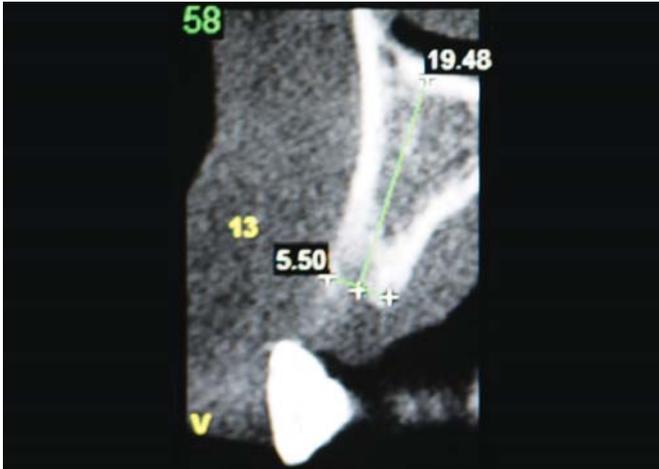


Fig. 9: CT scan showing complete restoration of the vestibular bone crest and total healing of the alveolar bone



Fig. 10: Region healed and healthy



Fig. 12: Immediate temporary crown without occlusal contacts



Fig. 11: Immediate temporary crown implant supported



Fig. 13: Osseointegrated dental implant after 6 months

treatment and definition of the prognosis of the tooth. In the case presented, the initial approach seems to have been well planned, based on initial radiographic imaging, but the fact of not having been performed periodontal orthodontic traction or periodontal exploratory procedure, may have been decisive for the failure, because the removal

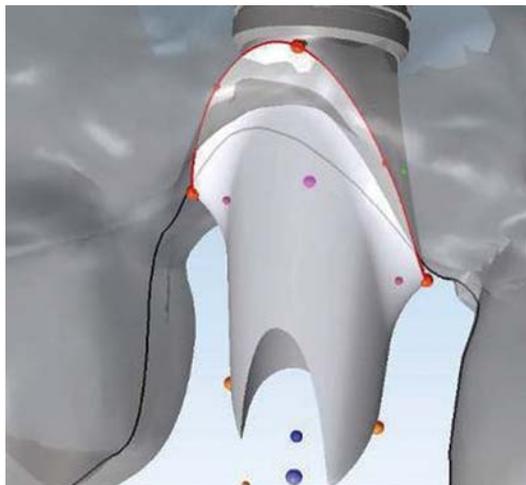


Fig. 14: Working in the CAD/CAM softwear

of the lesion may not be complete. This resulted in failure in the short-term, with worsening of clinical symptoms, with progression of the lesion in the apical direction to the point of separating the crown from the root. In this case, there was no alternative but to tooth extraction, given the extent of injury. By radiography, it can be seen that the remaining roots had no orthodontic traction conditions or increased clinical crown. The installation of dental implant, followed by preparation of ceramic crown, seems to be the best treatment option. After extraction, it was necessary for a period of 5 months to complete bone healing. The restoration of the vestibular crest bone could be observed on CT and during surgery. The high primary stability, with a final torque of 60N, allowed the immediate installation of a temporary crown, bringing more comfort to the patient. After 6 months, a period expected to allow for osseointegration, a crown esthetic was made and was functionally correct. Based on this and other reported clinical cases, it was concluded that early diagnosis of the ICR, even in routine examination is critical to proper treatment and favorable prognosis. Interdisciplinary treatment should be instituted

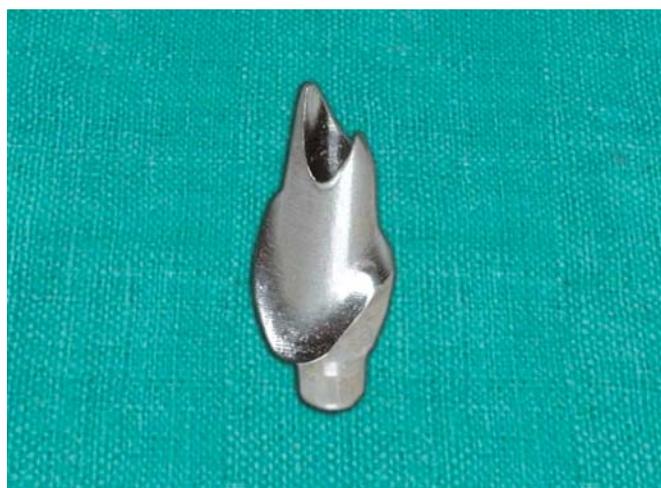


Fig. 15: CAD/CAM titanium abutment



Fig. 17: Adaptation of the crown in the abutment



Fig. 16: Ceramic metal-free crown



Fig. 18: Final result of cemented crown

as soon as possible, avoiding the loss of the affected tooth. Where the structural loss is very advanced, treatment involving the installation of osseointegrated implants should be considered the first choice of treatment.

MANUFACTURERS' DETAILS

- *Dental implant*: Internal-hex platform dental implant (Neodent, Curitiba, Brazil).
- *Titanium abutment*: CAD/CAM system (Neoshape, Neodent, Curitiba, Brazil).
- *Ceramic metal-free crown*: IPS e.max Press and IPS e.max Ceram Systems: (Ivoclar Vivadent, Amherst, NY).

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