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Case report

INVASIVE CERVICAL RESORPTION DUE TO IONTOPHORETIC INTERNAL BLEACHING WITH HYDROGEN PEROXIDE: TWO CASE REPORTS

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ABSTRACT:

Background: Invasive cervical resorption is a localised inflammatory-mediated aggressive form of an external root resorptive process of the tooth. One of the predisposing factors associated with ICR is the internal bleaching of non-vital teeth. The maxillary anterior teeth are highly affected among all tooth types.

Case reports: The clinical management and one-year follow-up results of two cases with invasive cervical resorption in maxillary central incisors due to iontophoretic internal whitening with 30% hydrogen peroxide are presented in this study. The complications associated with post-bleaching ICR as well the prevalence and underlying mechanism of this phenomenon and treatment planning, are discussed.

Conclusion: Clinicians should be alert to the possibility of ICR, especially following iontophoretic non-vital bleaching. A combined multidisciplinary treatment approach can be applied based on thorough clinical, radiographical and CBCT evaluation.

Keywords: invasive cervical resorption, internal bleaching, MTA

BACKGROUND

Invasive cervical resorption (ICR) is a localised inflammatory-mediated aggressive form of external root resorptive process that replaces mineralized tooth structure with granulomatous or fibro-osseous tissue. Its progression is limited in the extracanal area of the root and rarely invades the root canal space. The maxillary anterior teeth are highly affected among all tooth types. It is a rare disease with prevalence ranging from 0.02% to 2.3% but often leading to tooth loss due to its insidious and asymptomatic nature. [1-3]

There are several predisposing factors associated with ICR, such as orthodontic treatment, trauma, bruxism, and periodontal treatment that could cause physical damage to the precementum. The internal bleaching of discolorated endodontically treated teeth with hydrogen peroxide (HP) has shown a strong correlation with ICR as well. [1, 2, 4]

ICR lesions are classified by Heithersay into four categories based on the size and extension of resorptive defects into dentin. [1] Patel et al. have recently proposed a 3D classification method using cone-beam computed tomography (CBCT) according to the height, circumferential spread, and proximity of the ICR lesions to the root canal space. [5]

The phenomenon of external root resorption is not well understood, especially in general practice, and as a result, many lesions are misdiagnosed and treated incorrectly. Furthermore, the prognosis for treatment outcome of ICR lesions is poor because of the proximity to the critical crestal zone and gingival sulcus. [3, 6] The purpose of the current study is to present combined conservative-surgical management of two cases in upper central incisors with invasive cervical resorption as a result of an iontophoretic method for internal whitening with 30% hydrogen peroxide.

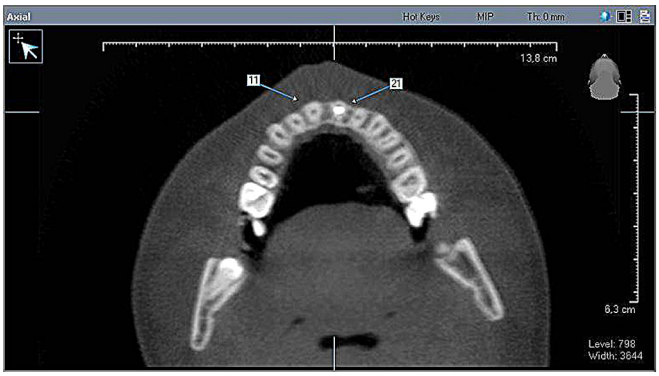
CASE DESCRIPTIONS

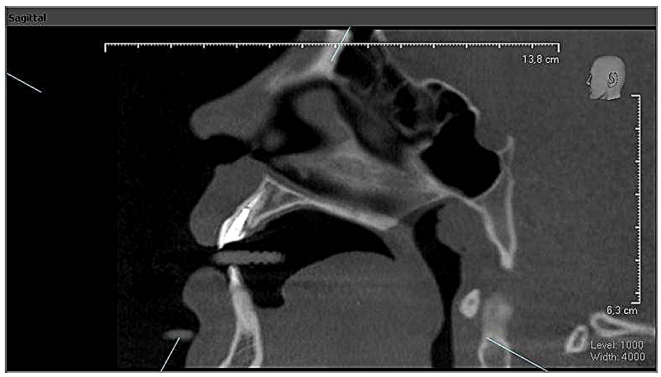
Case report 1

A 21-year-old female patient presented to the dental clinic with a chief complaint of past episodes of pain in the left upper central incisor region for 2-3 months. The patient gave a history of previous endodontic treatment and internal bleaching in the same tooth #21 4 years ago. On clinical examination, the tooth was asymptomatic with normal probing depth on both proximal aspects. Furthermore, the crown elongation was observed with slight yellow-brownish staining in the cervical part of the crown.

The radiographic evaluation revealed two symmetrical irregular subcrestal cervical lesions on the mesial and distal aspects of the root with an extent to the coronal third of the root involving root canal filling space. (Fig. 2A.) A CBCT image of the tooth indicated the exact circumferential spread of the lesions (Planmeca ProMax 3D Mid). The diagnosis was Class 3 invasive cervical resorption according to the Heithersay classification and Patel's Class 2Ap/2Bp. (Fig. 1.)

Fig. 1. Initial CBCT assessment. A) Axial plane shows a circumferential spread of the proximal lesions. B) Saggital plane – sound facial and palatal parts of the crown.

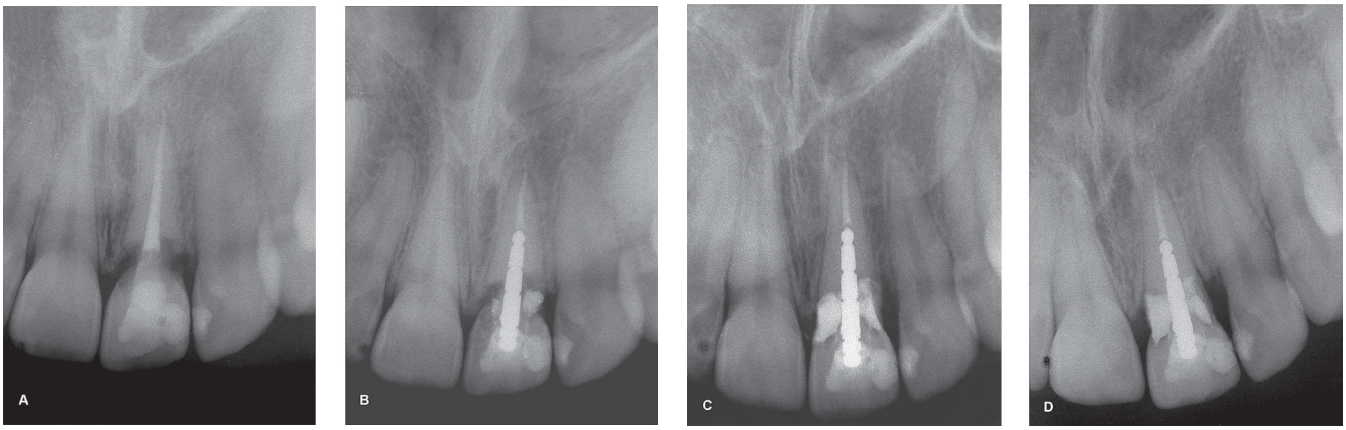




The patient was examined and evaluated by a multidisciplinary team. As the prognosis of this clinical case was questionable, and the lesions were not accessible for conservative external repair, two alternative treatment options were proposed to the patient: 1. Tooth extraction and immediate replacement with an osseointegrated implant; 2. An attempt to preserve the tooth but without any warranty of success. The patient was more inclined to preserve the tooth, so the second option was chosen along with informed consent. In addition, she refused an incisal alignment of the elongated crown.

A combined internal and external treatment approach was planned due to the extent of the ICR lesions on the tooth. The orthodontic extrusion was avoided because of the elongated crown. In order to reinforce the weakened tooth, a metal tapered passive Logan post H14 (14 mm long) was placed to increase the fracture resistance of the crown (ARMIRA, Bulgaria). (Fig. 2B.)

Fig. 2. Periapical radiographs. A) Initial radiograph of tooth 21 revealing two symmetrical subcrestal cervical lesions. B) Passive metal post placed into the root canal. C) A postoperative radiograph after repair of the defects with **white MTA-Angelus**. D) One-year follow-up radiograph showed a good healing result.



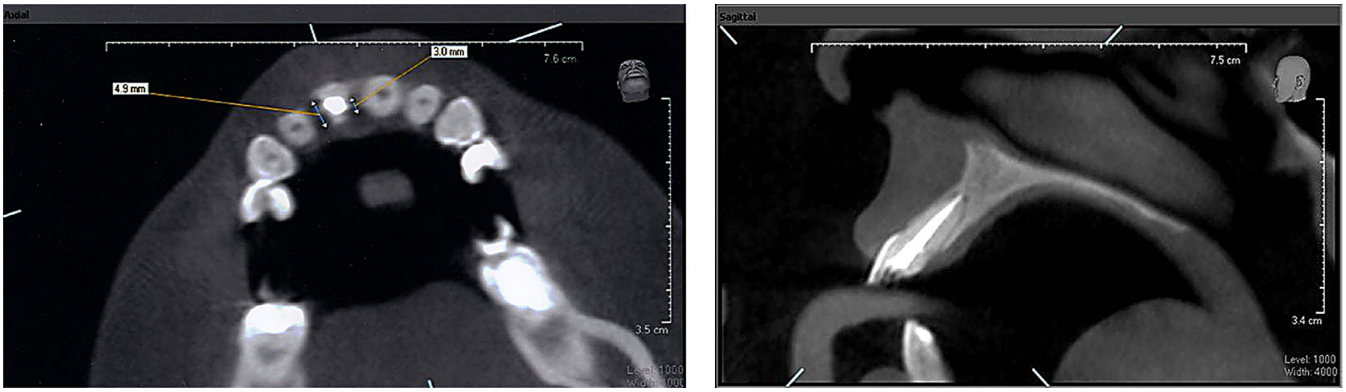
A full thickness small buccal and palatal mucoperiosteal flaps were reflected following infiltration anesthesia. A layer of the crestal bone was removed using tungsten carbide burs H1SX 016 (NTI – Kahla, Germany) under water cooling in order to gain access to the defects. Granulomatous tissue was not observed. The necrotic tooth hard tissues presented carious mass like consistency and were removed using stainless-steel round burs 014 (Komet, Gebr. Brasseler, Germany). Due to difficult isolation, 3% sodium hypochlorite was used to clean cavities instead of 90% trichloroacetic acid (TCA). The defects were then sealed with white MTA-Angelus (Angelus, Londrina, PR, Brazil). The postoperative radiograph indicated satisfactory sealing of the resorptive lesions. (Fig. 2C.)

At a 6-month follow-up, the patient was asymptomatic, the gingiva was free of inflammation, and the probing depth was normal. The radiograph revealed adequate periradicular healing and no pathologic changes around the restored resorptive defects. (Fig. 2D.)

Case report 2

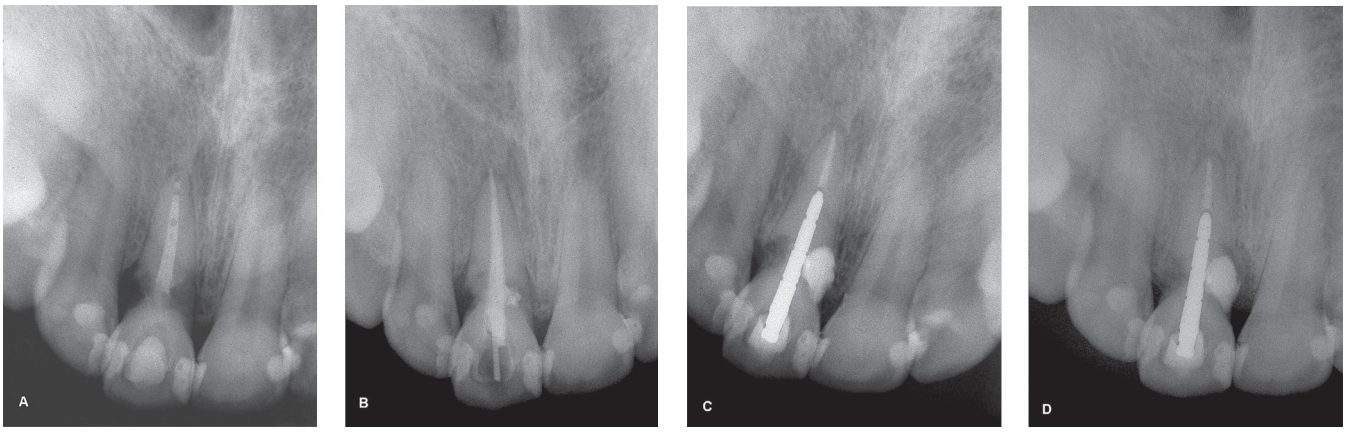
The second patient was a 25-year-old female complaining of reversed yellow-brownish staining and an unaesthetic appearance of her upper front tooth. The patient had a history of previous endodontic treatment and internal bleaching of tooth #11 about 5 years prior. Clinically, the toot was symptoms-free and without gingival inflammation. The radiograph and CBCT (Fig. 3) of the tooth revealed the same bilateral cervical pathological findings and unsatisfactory root canal filling. (Fig. 4A.) The lesions were diagnosed as Heithersay‘s Class 3 ICR lesion and Patel‘s Class 2Ap/2Bp.

Fig. 3. CBCT images. A). Axial plane showing the extension of the lesions in mm. B) Saggital plane.



Root canal retreatment was performed prior to ICR management. (Fig. 4B.) The same treatment approach was applied. The tooth surface on the distal aspect of the cervical zone was hard and smooth on probing without cavitation, therefore, only a small cotton pellet dipped in 90% TCA was applied with gentle pressure for 1 minute. The mesial lesion was cleaned and restored using white ProRoot MTA (Dentsply, Maillefer, Swisse). The postoperative radiograph revealed some amount of unintentional overcontouring of the MTA beyond the confines of the defect. (Fig. 4C.)

Fig. 4. A) Initial radiograph of tooth 11 revealing bilateral subcrestal ICR lesions. B) Endodontic retreatment. C) Postoperative radiograph after repair of the mesial defect with white **MTA ProRoot**. D) One-year follow-up radiograph showing vertical bone loss parallel to the over contoured MTA.



At a 6 month recall, the tooth was symptoms-free, but a localized gingival inflammation and suppuration on probing was observed mesiopalatally. Black colored strip of MTA was visible palatally near the gingival margin. The follow-up radiograph showed vertical bone loss around the overextruded material. (Fig. 4D.) It was assumed that the surface roughness of MTA has promoted plaque retention in the cervical area and led to a chronic periodontal problem. There was no progression in the extent of the unrestored distal defect.

DISCUSSION

This case report presents 2 cases of Class 3 ICR lesions in upper central incisors as a negative side effect of iontophoretic internal bleaching that were managed using a conservative internal approach followed by a surgical approach. The oral medical history of both patients excluded tooth trauma, but the second patient has undergone orthodontic treatment.

A beautiful smile plays an important role in social interactions. Discolored anterior teeth are considered an esthetic problem. [7] Root canal therapy is known as a main etiologic factor for intrinsic iatrogenic tooth staining attributed to the use of discoloring endodontic materials: intracanal medicaments, root canal sealers remnants regardless of their type and MTA-like cements. [8-10]

Intracoronal bleaching is more conservative than restorative methods, such as crowns and veneers, relatively simple to perform and less expensive. The procedures most commonly used for internal whitening of non-vital endodontically treated teeth are as follow: 1. In-office bleaching, so called “power bleach”; 2. Home-based bleaching, commonly named “walking bleach”. [3, 7, 11]

Hydrogen peroxide (HP) is the main bleaching agent, which in concentration 30% to 35% is a powerful oxidizer. [10, 12] In order to reduce the bleaching time, various methods for accelerating the decomposition of HP are used, such as heating (thermocatalytic technique), ultraviolet light,

different radiation sources including halogen lamps, light emitting diodes (LEDs), different laser types of various wavelengths, etc. [7] Dimitrov and Radeva introduced and evaluated a new method for internal whitening of discolored teeth by means of iontophoresis with 30% hydrogen peroxide. They reported excellent clinical aesthetic results in almost all cases. [13]

Bleaching chemicals, particularly 30% activated HP, may induce some complications such as external root resorption and coronal fracture. [1, 10] ICR can be considered a multifactorial disease. However, the exact mechanism of this pathologic phenomenon remains idiopathic and unclear. It is supposed that whitening agents are likely to diffuse through the dentinal tubules to the periodontium and to cause necrosis of the cementum, inflammation of the periodontal ligament, and subsequent root resorption due to odontoclastic activities. [3-5]

External cervical resorption may be detected occasionally as early as 6 months after bleaching. Most patients have a single ICR lesion. [2, 5, 14] Based on the thorough evaluation of the ICR lesion using CBCT and conventional radiographs, a nonsurgical or surgical approach can be chosen to manage this pathologic process. [3, 5, 6] In both described cases, bilateral symmetrical lesions were detected, and a multidisciplinary conservative-surgical approach was applied in order to reinforce the teeth and permit access to the subcrestal resorptive defects.

Different materials have been used to seal ICR lesions. Calcium silicate-based cements have been recently suggested as a material to restore the defects of ICR. These materials have shown excellent biocompatibility with osteoinductive, cementoconductive and cementoinductive properties. [2, 6, 15, 16]

ICR is a rare pathological phenomenon, especially as a negative side effect of internal bleaching. In previous epidemiological researches and case reports published in the period from 1990 to 2015, intra-coronal bleaching was identified as the one of main risk factors for ICR (3.9-13.6%). [1-4] However, in recent years, studies have shown a significant decrease in the incidence rate of ICR caused by bleaching (1-3%) [4, 17] or have found no such cases. [14, 18] Recently, only one case report regarding post-bleaching ICR has been found in the literature. [19]

It may be hypothesized that iontophoretic activation of the 30% hydrogen peroxide facilitates deeper penetration of the ions despite the placed glass-ionomer cement barrier. This technique is associated with a risk of ICR, therefore, its application should be avoided. Nowadays, "walking bleach" is preferred because it is safer and more comfortable for the patient. Furthermore, hydrogen peroxide may be successfully replaced with other effective and less aggressive bleaching agents, such as carbamide peroxide and sodium perborate. [7, 10, 11]

To the best of the author's knowledge, this is the first clinical study reporting ICR after iontophoretic internal whitening. A retrospective clinical outcome study is required to evaluate the long-term results of this technique. A further follow-up in the present cases is intended to evaluate the long-term prognosis of the restored ICR defects, as well.

CONCLUSION

Management of ICR is a clinical challenge. Clinicians should be alert to the possibility of ICR, especially following iontophoretic non-vital bleaching. A combined multidisciplinary treatment approach can be applied based on thorough clinical, radiographical and CBCT evaluation. Although this study presents a limited follow-up period, this information may be helpful in diagnosing ICR at an early stage.

Abbreviations:
CBCT - cone-beam computed tomography
HP - hydrogen peroxide
ICR – invasive cervical resorption
MTA – Mineral trioxide aggregate
TCA - trichloroacetic acid

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