

Non Surgical Management of Class I Invasive Cervical Resorption and Anterior Aesthetic Rehabilitation: A Case Report with 2-Years Follow-Up

GIRISH NANJANAWAR¹, SAQUIB MULLA², DIVYA GUPTA³, SHARAD KAMAT⁴

ABSTRACT

Amongst all the types of external resorption, External Cervical Resorption (ECR) is the least understood. ECR usually encompasses the cervical region of the tooth and is located immediately below the epithelial attachment. The diagnosis and management of ECR defects is usually difficult. However, a comprehensive knowledge pertaining to the true nature and exact location of the defect helps achieve effective management and render appropriate treatment. Advancements in digital imaging like Cone Beam Computed Tomography (CBCT) have made possible, the diagnosis of pathological lesions like ECR with greater precision. Here we report a case of 21-years old male patient, treated with the successful retreatment of maxillary central incisor along with the non invasive management of ECR associated with the tooth. The patient presented with a history of spontaneous pain in respect to maxillary left central incisor and punched out radiolucent lesion was evident on the disto-cervical aspect radiographically. It also revealed an incomplete endodontic treatment. As the patient was not willing for any surgical intervention, conservative non-surgical endodontic re-treatment was performed which involved long term calcium-hydroxide therapy. At two years follow-up, the patient remained asymptomatic demonstrating radiographic evidence of bone-like tissue filling the resorptive defect. The clinical implications of this paper aim at an appropriate diagnosis of the resorptive lesion using three dimensional (3D) imaging techniques and a conservative non surgical long term calcium-hydroxide therapy for the management of ECR. The endodontic treatment was further followed by aesthetic rehabilitation for the asymmetric smile correction using minimally invasive technique of EMax crowns.

Keywords: Calcium hydroxide, Dental aesthetics, External resorption, Root resorption, Tooth discoloration

CASE REPORT

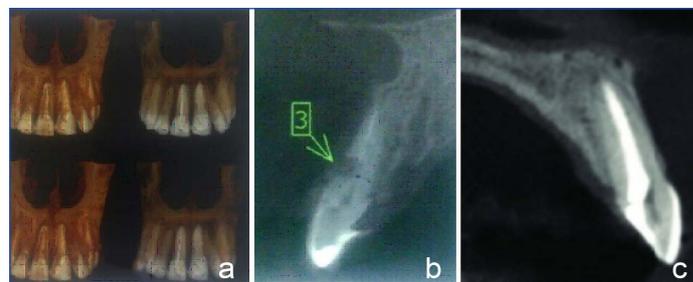
A 21-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of intermittent spontaneous pain over one month in relation to upper left central incisor and discoloration in upper right central incisor since few months [Table/Fig-1 a,b]. Patient gave a history of impact trauma to the upper anterior teeth 7-8 years ago. Dental history revealed that he had undergone endodontic treatment with maxillary right and left central incisors 7 years ago. The maxillary right and left lateral incisors exhibited protrusion thereby creating an asymmetric smile pattern and poor dental aesthetics. Medical history was non contributory.



[Table/Fig-1]: Pre-operative intraoral photographs showing discoloured and extruded 11, and protruded 22 along with an asymmetric smile pattern and poor dental aesthetics: a) Labial view; b) Palatal view

On clinical examination, maxillary right central incisor was found to be discoloured and was extruded 2 mm in relation to the left one. Teeth were not tender on percussion or palpation. On probing with a Community Periodontal Index for Treatment Needs (CPITN)-C probe, probing depth for both teeth was within normal limits (<2mm); however probing on the disto-palatal side of #21 caused profound bleeding. Moreover, assessment with an explorer revealed a cavitated lesion in #21 just below the cervical margin located disto-palately. To understand the specific anatomical knowledge in three dimensions, patient was referred for a CBCT analysis [Table/Fig-2].

The axial slices revealed the entry points of the granulomatous tissue to be located in the disto-palatal region at the bone crest. It showed irregular canal morphology with scattered radiopacity indicative of Invasive Cervical Resorption (ICR). There was no communication with the root canal. A small invasive resorptive lesion was evident close to the cervical area with shallow dentinal penetration, which helped to establish the clinical classification of ICR Class I (Heithersay's GS classification) [1]. Although, there was no frank communication with the root canal of the tooth, the invasive resorptive process was encroaching upon cervical and middle third of the root. The clinical findings and CBCT analysis were not suggestive of any resorptive defect in respect to 11 [Table/Fig-2].



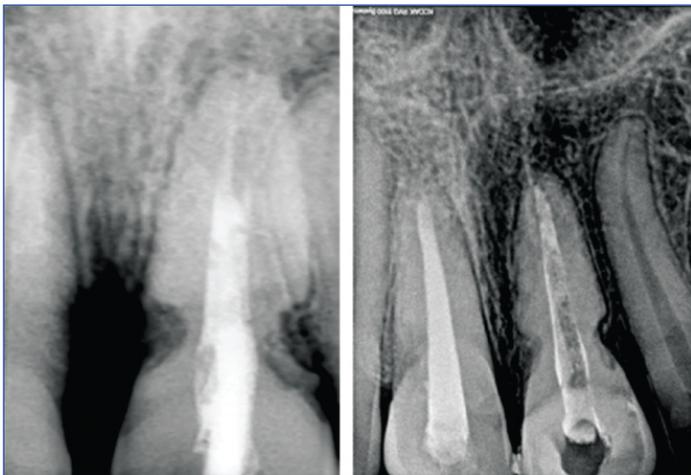
[Table/Fig-2]: Preoperative cone beam computed tomographic analysis slices: a) CBCT slice showing the location and extent of invasive cervical resorption; b) Sagittal CBCT slice showing outer inflammatory resorption (green arrow); c) Preoperative Cone Beam Computed Tomographic (CBCT) analysis slice showing a well-obtured canal.

Periapical radiographs revealed incomplete endodontic treatment in respect to 21. A radiolucent resorptive lesion was discovered in the disto-cervical region in respect to 21 [Table/Fig-3]. Based on the patient's history, clinical examinations and nature of the lesion, besides the location and extension of the radiolucent lesion to the

coronal third of the root of 21, a diagnosis of pulp necrosis with Heithersay's GS Class I ICR was established [1]. Minimal extension of the resorptive defect into the radicular dentine and its location being just below the level of epithelial attachment justified it to be classified as Class I ICR defect [1]. Heithersay GS has proposed good prognosis for Class I-III resorptive defects [1].

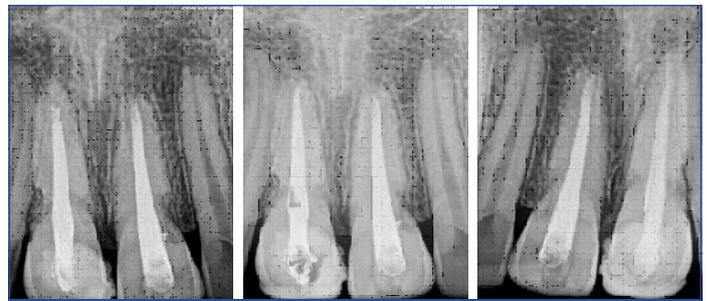
Patient was explained about the condition of cervical resorption in upper left central incisor. All the consequences and prognosis of the treatment were explained to the patient. The alternative treatment option like surgical repair of the resorptive defect with glass ionomer cement and composite resin was also explained with its associated incidence of recurrence. However, patient did not consent to any surgical treatment owing to the invasive nature of the procedure involved.

Therefore, a guarded approach was adopted in which the necrotic pulp was removed, calcium hydroxide dressing was given and the canal was later obturated. After obtaining informed consent; endodontic retreatment was initiated with 21 followed by non surgical management of the cervical resorption. After rubber dam application, modification was done in the access cavity using a diamond coated fissure bur (Diatech, Heerbrugg, Switzerland). The previously placed gutta-percha was removed with 2% ISO #25-H file and gutta-percha solvent (RC Solve, Prime Dental Products, India) [Table/Fig-4] The working length was determined with apex locator (Root ZX II J.Morita, USA) and confirmed radiographically. The canal was prepared till #70 K file using the traditional step back technique for the tooth 21. Recapitulation was carried out between each instrument usage, irrigating the canal with 2 ml of 5.25% sodium hypochlorite. Calcium hydroxide (Metapex, Biomed Co. Ltd., South Korea) was placed as the intracanal medicament. Cotton pellet was placed and Cavit (3M ESPE) was used to seal the access cavity [Table/Fig-5]. At three months follow-up, the patient had no complain of exudative discharge.



[Table/Fig-3]: Pre-operative intra oral periapical radiograph. **[Table/Fig-4]:** Removal of previously placed gutta-percha in respect to 21. (Images from left to right)

There was complete absence of discharge even at six months follow-up period. A fresh dressing of $\text{Ca}(\text{OH})_2$ was replenished at every one month interval till there was evidence of total cessation of resorption and evidence of remineralization both clinically and radiographically. After nine months, radiographic evidence showed no extension of resorption and hence the endodontic treatment was completed with cold lateral compaction technique using 2% No. 70 Gutta percha cone (Dentsply Maillefer, Switzerland) and Sealapex sealer (Pulp Canal Sealer, Kerr, MI, USA) [Table/Fig-6]. The access cavity was sealed using resin composite (3M ESPE, USA). The resorptive condition remained static even after nine months follow-up visit and the teeth were asymptomatic [Table/Fig-7]. To elevate the cervical root lesion from within the alveolar socket, fiberotomy was done thereby facilitating the placement of future crown margins on sound dentin beyond the infected cervical area.



[Table/Fig-5]: Placement of $\text{Ca}(\text{OH})_2$ intracanal medicament. **[Table/Fig-6]:** Postobturation radiograph. **[Table/Fig-7]:** Nine months follow-up radiograph. $\text{Ca}(\text{OH})_2$: Calcium Hydroxide. (Images from left to right)

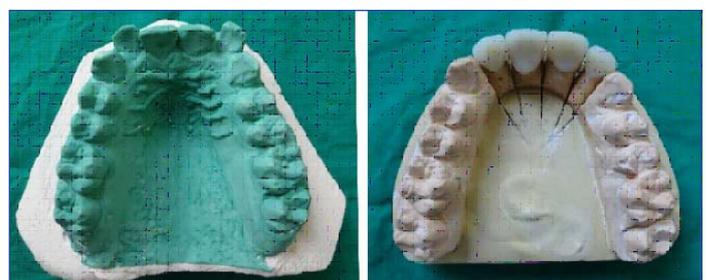
Although the tooth 11 remained discolored after endodontic treatment, intra-coronal bleaching was not opted for its aesthetic improvement as it is amongst one of the aetiologies initiating cervical resorption. The patient was informed of this possible adverse outcome and was explained other cosmetic treatment options including orthodontic correction, or ceramic crowns, and he was interested in correcting the anterior teeth alignment prosthetically. Crown preparation was done for 22 21 11 12 for E-Max crown [Table/Fig-8a,b]. Final impression was recorded using poly-vinyl siloxane impression material (3M ESPE). Shade selection was done using Vita classical shade guide. Luting of provisional restorations was done with non eugenol cement [Table/Fig-9]. The luting of individual EMax crowns for 11 12 21 22 were carried out using self-adhesive resin cement (Relyx U200, 3M) [Table/Fig-10,11(a,b)].



[Table/Fig-8]: Tooth preparation with 11,12,21,22: (a) Labial view; b) Palatal view.



[Table/Fig-9]: Temporisation.



[Table/Fig-10]: Casts comparing the change in occlusion.



[Table/Fig-11]: Cementation of EMax crowns with 11,12,21,22: a) Labial view; b) Palatal view.

The patient was re-evaluated on a regular basis. The patient was recalled for radiographic evaluation after two years and reduction of cervical radiolucency (improved radiopacity compared with previous radiographs due to bone or bone-like tissue in-filling the defect) indicated reparative procedure of apical bone regeneration [Table/Fig-12]. No signs were detectable of this radio-opaque tissue progressing into ankylosis of the tooth. The teeth were asymptomatic with no periodontal pockets circumferentially.



[Table/Fig-12]: Two years follow-up radiograph showing reduction in the cervical radiolucency and radiopacity within the defect suggestive of bone-like tissue filling the defect.

DISCUSSION

Root resorption, the odontoclastic loss of hard dental tissues like dentin and cementum, is classified as internal or external resorption [2]. Root resorption of permanent dentition if left untreated might lead to irreversible damage and/or eventually loss of the tooth [2]. One of the types of external resorption is ECR which is complex and aggressive in nature, thereby necessitating accurate diagnosis and appropriate treatment [2]. Several deciding factors such as severity, location, canal space perforation and restorability of the tooth play a key role to opt the appropriate treatment modality for the management of ECR. Large resorptive defects can be managed by surgical exposure of the defect, curettage of the granulomatous tissue and filling of the defect with tooth-coloured restorative materials [2]. Heithersay GS recommended topical application of a 90% aqueous solution of trichloroacetic acid, curettage, and restoration with glass ionomer cement [3].

There is literature support on successful non-surgical management of resorptive defect [4,5]. It can be accomplished through various procedures as tooth trepanation, removal of residual vital pulp tissue and induction of development of new granular tissue, application of either Calcium hydroxide, Metapex, Mineral Trioxide Aggregate, Calcium phosphate cement or hydroxyapatite [2]. According to Heithersay GS, 15.1% of the teeth undergoing trauma subsequently developed ECR [1]. Maxillary central incisors frequently undergo trauma and hence are predisposed to developing ICR [6]. ICR is a form of hyperplastic invasive tooth resorption which involves the loss of cementum and dentine owing to an odontoclastic activity and is usually found to occur below the epithelial attachment and coronal aspect of the supporting alveolar process [7].

CBCT offers an enhanced 3D image of the tooth, true nature of lesion, surrounding structures, perforations and hence treatment outcomes can be precisely determined [8]. In this case, CBCT was an indispensable diagnostic tool to determine the location and extent of ICR, which otherwise would have been difficult to analyse on two-dimensional (2D) radiographic images. Radiovisiography (RVG) or Intraoral Periapical Radiograph (IOPA). In the present case, the invasive lesion did not exhibit any clinical or radiographical signs of penetration into the pulp space or affecting the adjacent alveolar bone. In this case report, an interdisciplinary approach was taken, combining non surgical endodontic treatment and to elevate the

cervical root lesion from within the alveolar socket, fiberotomy was done thereby facilitating the placement of future crown margins on sound dentin beyond the infected cervical area.

When the lesion is having an adequate access and there is no breach in the integrity of the external surface of the tooth, an internal treatment regime is usually preferred. Total elimination of the pathological resorptive tissue from inside the tooth is not achievable hence meticulous chemo-mechanical debridement is necessary to halt the progression of resorption [9].

After the adequate cleaning of the canal space and placement of calcium hydroxide as an intra-canal medicament, the noxious stimulating factors emanating from the necrotic pulp, entering the periodontal tissues, were eliminated [10]. $\text{Ca}(\text{OH})_2$ intracanal medicament furnishes hydroxyl ions thereby creating an alkaline environment which will promote repair and active calcification [4]. Lactic acid liberated from the osteoclasts gets neutralized by the alkaline pH and thus dissolution of the mineral components of dentine is prevented [4]. Additionally, alkaline pH activates alkaline phosphatase for tissue formation [4]. An adequate treatment eliminates the infection and irritation thereby allowing the cementoblasts and periodontal ligamental cells to gradually resurface the damaged root. This protects it from any further infection and serves as an explanation for the stoppage of the invasive resorptive defect [4].

Chowdhury SS and Alam MS conservatively treated a case of internal root resorption with long term calcium-hydroxide therapy in which there was cessation of resorptive process and formation of a calcific bridge eight months post-treatment [4]. Asgary S and Nosrat A reported a rare case of Class IV invasive cervical root resorption as a sequel of orthodontic treatment, which involved perforation of the root canal space, a radiolucent crestal bony defect, along with a periapical lesion. After the biomechanical preparation, calcium-enriched mixture cement was used to obturate the canal and sealing of the perforation site. At the follow-up period of twenty-four months, post-treatment the resorptive activity was found to be ceased along with osseous healing of the crestal bony defect and periapical lesion radiographically [11].

Aggarwal V and Singla M reported a case of severe external inflammatory root resorption in which chemomechanical preparation was followed by placement of intracanal medicament for ten days and subsequent obturation of the total canal space with Mineral Trioxide Aggregate. A 48 month follow up review suggested that the resorption had arrested with satisfactorily acceptable clinical results [12]. Iontophoretic delivery of calcitonin to the resorptive lesion through dentinal tubules is a novel technique that could make conservative management possible. Osteoprotegerin and bisphosphonates are other potential medicaments [13].

Adequate diagnosis and meticulous planning of the treatment procedure thereafter are of utmost importance in the proper management of resorptive defects [14]. The fact that progress of the invasive defect seems to halt in the two-years follow-up radiograph indicates that the advancing granulation tissue could have been stimulated by not only the once damaged periodontal cells, but also the continuous leakage of noxious stimuli produced by the bacteria in the necrotic pulp into the periodontium through dentinal tubules, lateral and accessory canals [2].

CONCLUSION(S)

It can be concluded that effective chemo-mechanical debridement along with long term calcium hydroxide therapy could serve as conservative treatment modality to halt the progression of the resorptive lesion thereby producing satisfactory healing of the tooth and predictable clinical results.

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PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Conservative Dentistry and Endodontics, Bharati Vidyapeeth (Deemed to be) University Dental College and Hospital Sangli, Maharashtra, India.
2. Research Scholar, Department of Conservative Dentistry and Endodontics, Bharati Vidyapeeth (Deemed to be) University Dental College and Hospital Sangli, Maharashtra, India.
3. Assistant Professor, Department of Conservative Dentistry and Endodontics, D Y Patil Dental School, Pune, Maharashtra, India.
4. Professor and Head of Department, Department of Conservative Dentistry and Endodontics, Bharati Vidyapeeth (Deemed to be) University Dental College and Hospital Sangli, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Divya Gupta,
Department of Conservative Dentistry and Endodontics, D. Y. Patil Dental School,
Dr D. Y. Patil Knowledge City, Charholi-Budruk, via Lohegaon,
Pune-412105, Maharashtra, India.
E-mail: divyagupta8989@yahoo.co

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