



ORIGINAL RESEARCH PAPER

Endodontics

MANAGEMENT OF TRAUMATIZED, SEVERELY CALCIFIED CENTRAL INCISOR WITH INVASIVE CERVICAL RESORPTION: A CASE REPORT

KEY WORDS: Invasive cervical resorption, Biodentine, Pulp canal obliteration, Endodontic therapy

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ABSTRACT

Invasive cervical resorption (ICR) is an uncommon and potentially destructive form of external root resorption that can compromise the structural integrity and prognosis of affected teeth. Management becomes particularly challenging when ICR is associated with extensive pulp canal obliteration and pulpal necrosis following traumatic dental injury. Accurate three-dimensional assessment and precise removal of the resorptive tissue are essential for conservative treatment.

INTRODUCTION

Traumatic injuries to anterior teeth frequently present an additional clinical challenge due to progressive pulp canal obliteration (PCO), which results from excessive deposition of hard tissue within the pulp space following injury. In many cases, the canal becomes partially or completely calcified, making conventional endodontic access and canal negotiation extremely difficult. Such teeth may remain asymptomatic for several years; however, they are susceptible to pulpal necrosis, periapical pathology, and, in some instances, external cervical resorption. Management of these cases requires careful diagnosis, meticulous treatment planning, and enhanced visualization to minimize unnecessary removal of tooth structure and reduce the risk of procedural complications.¹

Invasive cervical resorption (ICR) is a relatively rare and aggressive form of external root resorption that originates in the cervical region of the tooth. Because of its variable clinical and radiographic presentation, it is often difficult to diagnose in its early stages and may be mistaken for other conditions such as internal root resorption or cervical caries. Delayed or incorrect diagnosis can result in extensive destruction of the tooth structure and may ultimately compromise the long-term prognosis. Early identification and appropriate treatment are therefore essential for preserving the affected tooth.²

The primary objective in managing ICR is the complete elimination of the resorptive process, followed by restoration of the defect using a biocompatible material that promotes periodontal healing while providing an effective seal. The selection of treatment depends on the extent and location of the lesion, the restorability of the tooth, and the patient's overall clinical condition.³

Recent advances in endodontic microsurgery, particularly the use of dental operating microscope (DOM), have significantly improved the management of resorptive defects. Enhanced illumination and magnification allow precise identification of the lesion, complete removal of resorptive tissue, and conservative management of the surrounding healthy tooth structure, thereby improving treatment outcomes.⁴

The present case report describes the successful management of invasive cervical resorption in a traumatized

maxillary left central incisor with a completely calcified root canal. The lesion was treated under a dental operating microscope, enabling precise debridement of the resorptive tissue and restoration of the defect using Biodentine.

Case Presentation

A 24-year-old male patient presented to the department with fractured upper front teeth and a history of trauma 7 years ago. Clinical and radiographic examination revealed canal calcification in tooth 11 and 21, with periapical lesion i.r.t 21. Both cold test and EPT showed no response, suggestive of pulp necrosis indicating the need for root canal treatment. No relevant medical history and no extra-oral changes were observed. The initial periapical radiograph revealed severe root canal obliteration, presence of invasive cervical resorption located in the region of the cervical third of the root and widening of periodontal ligament space. As a complementary means of diagnosis and planning, a preoperative cone beam computed tomography (CBCT) scan (CS9600, Carestream Health, Rochester, New York) was performed to determine the extent of resorption and pulp canal obliteration.

The patient was given two options: conventional root canal treatment followed by full coverage crowns or guided minimally invasive endodontic approach through the incisal third followed by ceramic veneer.

In the first visit, after infiltration anesthesia with lignocaine 2% with epinephrine 1:80,000 and absolute isolation, access to the root canal orifice was obtained with a spherical diamond bur rotating at high-speed, under microscope. ISO steel hand files #8 K and #10 K (Mani, Utsunomiya, Japan), D finders and ISO #10 C-Pilot hand files were used to obtain canal patency. Working length was determined using electronic apex locator and confirmed radiographically (WL-23mm).

In the second visit, instrumentation was performed with the NeoEndo Flex file system (Orikam Healthcare, India) up till #30, 4% taper. The canal was irrigated with 3.25% sodium hypochlorite (Safe Endo) throughout the entire instrumentation procedure. The final irrigation protocol performed consisted of 17% EDTA (Prime dental products, India) for 1 minute, followed by 3.25% sodium hypochlorite. The canal was dried with absorbent points and obturation was

performed with resin-based sealer (Sealmax-R; Maarc Dental) and gutta-percha using single cone obturation technique. After cleaning the pulp chamber with alcohol, glass ionomer cement was used for intracoronal sealing, and provisional restoration was performed.

In the third appointment, post space preparation was done, canal irrigated with 3.25%NaOCl and dried with absorbable paper points and fibre post was cemented using Rely X U200 (3M ESPE Rely X U200 Self-Adhesive Resin Cements) and composite core build up was done. After restoration, incision was made and triangular full thickness flap was reflected and hemostasis was achieved. A large circular resorptive area was seen clearly from the surgical site containing granulation tissue under the DOM. Following surgical exposure, the resorptive defect was thoroughly irrigated using alternating applications of 3% sodium hypochlorite (NaOCl) and 17% ethylenediamine tetraacetic acid (EDTA). Sodium hypochlorite was used for its potent antimicrobial action and ability to dissolve residual organic tissue, while EDTA facilitated smear layer removal and exposed dentin-derived growth factors, including transforming growth factor-beta 1 (TGF-β1), which may contribute to favorable healing.

After irrigation, all granulation tissue within the resorptive cavity was carefully removed by meticulous curettage until healthy surrounding tissues were obtained. A small cotton pellet was then dipped in 90% trichloroacetic acid, and the excess was removed by dabbing it on a piece of gauze. The cotton pellet was then applied over the resorptive defect area with gentle pressure for about 1 min. The irregular borders of the defect were smoothed with a small round bur. The resorptive area was restored with Biodentine (Septodont, St. Maurdes Fossés, France) was mixed according to the manufacturer's instructions. The material was left for fifteen minutes to achieve the initial setting and relative hardness. Finally, the flap was sutured with 3-0 silk suture and the patient was instructed to report after a week for suture removal. Postoperative IOPA radiograph was taken. After suture removal, the patient was subsequently advised for regular follow ups.



(a) CBCT image showing pulp canal obliteration and resorptive defect (b) Pre operative IOPA radiograph (c) Locating the canal orifice (d) Canal negotiation and working length determination (e) Master cone radiograph (f) Obturation using Sealmax R sealer (g) Post space preparation with femur apical GP (h) Fibre post placement (i) composite restoration (j) full thickness flap raised to expose cervical resorption defect (k) Sealing of defect with Biodentine (l) Postoperative IOPA radiograph

DISCUSSION

Traumatic injuries to the maxillary anterior teeth may lead to pulp canal obliteration, pulpal necrosis, and crown discoloration. Accurate diagnosis relies on careful clinical examination, radiographic assessment, and pulp sensibility testing to determine the pulpal status.⁵

Cone-beam computed tomography (CBCT) provides three-dimensional visualization of canal calcification and associated periapical pathology, improving diagnostic accuracy and facilitating precise treatment planning in complex endodontic cases.

Successful management of invasive cervical resorption depends on early diagnosis, identification of the underlying etiology, and complete elimination of the resorptive tissue. Radiographic evaluation, particularly with CBCT, is essential for differentiating ICR from internal root resorption and

determining the extent of the defect. In the present case, a history of dental trauma was considered the most likely etiological factor. The prolonged untreated period, combined with pulpal necrosis, canal calcification and periapical pathology, likely contributed to the progression of the resorptive lesion.⁶

Because of the extensive communication between the resorptive defect and the root canal system, a combined endodontic and surgical approach was performed to minimize the risk of reinfection. Following complete debridement, the defect was restored with Biodentine owing to its excellent sealing ability, short setting time, biocompatibility, and bioactive properties that promote hard tissue repair and periodontal healing.⁷

The use of dental operating microscope (DOM) provided superior magnification and illumination, allowing precise removal of the resorptive tissue while preserving healthy tooth structure. This improved surgical accuracy and contributed to favorable clinical outcome with minimal postoperative discomfort.⁸

CONCLUSION

Proper diagnosis, case selection and its implementation can lead to successful outcome and long-term retention of the tooth. Use of CBCT allows three-dimensional localization of the extent of canal obliteration and resorptive defect which makes the treatment predictable.

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