Case Report

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Management of Invasive Cervical Resorption Using MTA with Cone Beam Computed Tomography as A Diagnostic Aid: A Report of Two Cases

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ABSTRACT

Background: Invasive cervical resorption which was characterized by its cervical location and invasive nature leads to the progressive destruction of tooth structure where the etiology is multifactorial. The diagnosis of ICR can be challenging, and detection is often by an incidental radiographic finding. The radiographic appearance of ICR varies considerably depending on the size and nature of the lesion. Proper diagnosis with advancements in digital imaging and management of this condition with biocompatible material with mineralization properties is key to the successful outcome. This article aimed to discuss two case reports of invasive cervical root resorption and its management using material like MTA.

Keywords: Mineral Trioxide Aggregate; invasive cervical root resorption; CBCT, Diode laser.

INTRODUCTION

Tooth resorption presents a challenge in dentistry due to its complexity of origin. The oldest report about resorption of dental structures was described by Michael Blum in 1530 in a book 'The Science & Art of the Dental Surgery[1]. It defined as loss of hard dental tissue as a result of odontoclastic action[1]. Resorption can be classified by its location with the root surface i.e. internal or external resorption and communicating type.[2]

Invasive cervical resorption (ICR) is a form of external root resorption which includes both vital and nonvital teeth. It is defined as a localized resorptive process that involves the surface of root below epithelial attachment and coronal to supporting the alveolar process. It may present as a clinical pinkish hue which has to be differentiated from internal resorption.[3] Several predisposing factors have been identified which include intra-coronal bleaching, trauma, orthodontics, and periodontal factors etc.[4]

The diagnosis of ICR can be challenging, and detection is often by an incidental radiographic finding.[1] Clinically, successful treatment of ICR depends on the extent of the resorptive process, and the most preferential classification system was introduced by Heithersay in 1999 into four classes depending upon periapical radiographs. Class 1 and 2 do not involve the pulp whereas 3 and 4 involve the pulp [image 1].[3]The limitations of the Heithersay classification to characterize ICR lesions such as lesion circumference and location. With advancements in imaging, Cone-beam computed tomography (CBCT) is useful inaccurate diagnosis and treatment planning as recommended in the

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European Society of Endodontology position statement (2014) and AAE/AAOMR (2015) position statements.[5] The increased accuracy of CBCT compared to Periapical radiographs in determining the nature and location of ICR, it would be desirable to have a clinically relevant 3-dimensional classification for ECR.

This new clinical classification takes into account the lesion height, circumferential spread, and proximity to the root canal, thus classifying ECR in 3-dimension [Table 1]. Based on this classification treatment varies: height of the lesion if it is supracrestal no need of flap elevation, subcrestal requires flap elevation, and involvement of pulp requires root canal treatment.

Fig 1: Heithersay resorption classification[3]

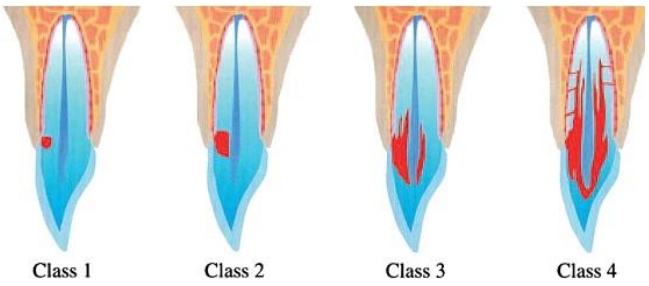

Table 1: New classification[5]

Height	Circumferential spread	Proximity to the roo canal
1: At cemento-enamel junction level or coronal to the bone crest (supracrestal)	**A:** ≤ 90°	**d:** Lesion confined to dentine
2: Extends into coronal-third of the root and apical to the bone crest (subcrestal)	**B:** > 90° - ≤180°	**p:** Probable pulpal involvement
3: Extends into mid-third of the root	**C:** > 180° - ≤270°	
4: Extends into apical-third of the root	**D:** >270°	

Various materials have been used to seal the invasive cervical resorptive defect such as glass-ionomer cement (GIC), mineral trioxide aggregate (MTA), calcium-enriched mixture, bioaggregate, biodentine, Endosequence root repair, and Endosequence BC sealer. MTA has favorable chemical and physical properties, sealing ability, antibacterial activity, and biocompatibility and creates an ideal environment for hard-tissue healing and remineralization.[6]

The following case reports discuss the diagnosis and clinical management of external cervical resorption with successful follow up.

CASE REPORT 1

A 25-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of discoloration in the left maxillary central incisor. History of dental trauma 10 years ago and the tooth was asymptomatic. On intraoral examination [Fig 1a], pinkish discoloration of maxillary left central incisor near the cervical area. On radiograph depicted an irregular lesion at the cervical third of the tooth. A diagnosis of chronic apical periodontitis with class 3 type of invasive cervical resorption was made for maxillary left central incisor based on periapical radiograph according to Heithersay [Fig 1b].

Fig 1a: Pre-operative clinical image.

Fig 1b: Pre-operative IOPA irt 21.

Fig 1c: 3D imaging using CBCT irt 21.

Fig 1d: 3D imaging using CBCT irt 21.

Fig 1e: Rubber dam isolation.

Fig 1f: Working length determination.

Fig 1g: Obturation done irt 21.

Fig 1h: MTA placed in resorptive defect.

Fig 1i: Immediate post-operative.

Fig 1j: After 6 months crown was placed.

CBCT was advised for further investigation. On interpretation of CBCT, it was supraosseous defect [Figure 1c,d] and classified according to a new classification of CBCT as 1Ap [1-indicates at Cemento-enamel junction level or coronal to the bone crest (supracrestal), A-≤ 90° -circumferential spread, p- Probable pulpal involvement]. The lesion was supragingival and clinically accessible, a non-surgical approach was opted to repair the resorptive lesion

After obtaining consent from the patient local anesthesia (2% lignox, with adrenaline 1:80,000, Indoco Remedies Ltd., Mumbai) was administered followed by rubber dam isolation, access cavity preparation was done on the lingual surface and canal located[fig 1 e,f]. Chemo mechanical preparation was done till F3 Protaper universal rotary system (Dentsply, Maillefer, Switzerland), and irrigation was done with Sodium hypochlorite [NaOCL] solution which is 3% (Vishal Dentocare Pvt., Ltd., Ahmedabad, Gujarat), followed by 17% ethylenediaminetetraciticacid (EDTA) and a final rinse with 2% Chlorhexidine [CHX].

Granulomatous tissue was excavated from the resorptive area. The resorptive area was treated with 90% TCA [Trichloroaceticacid] (Organo Biotech Laboratories Pvt ltd, Mayapuri, Delhi) for 30 s. Calcium hydroxide dressing was given for 1 week. After 1-week, irrigation followed by obturation was done using thermo plasticized obturation technique [Obtura 2] [Fig 1 g]. The resorptive area was filled with MTA [MTA ANGELUS] followed by moist cotton pellet and restored temporarily with type 2 Glass ionomer cement [GC FUJI II]. After 24 hrs cotton pellet was removed and restored with GIC and visible light cure composite restoration [Tetric N-Ceram Ivoclar vivadent][Fig 1h].

Periodic evaluation was done for 1, 3, and 6 months. After 6 months full coverage all-ceramic crown was placed [fig 1 j]. The follow up was carried out for 9 - 12 months and the tooth remained asymptomatic both clinically and radiographically.

CASE REPORT 2

A 19-year-old female patient reported to the Department of Conservative and Endodontics with a chief complaint of pain in the upper front teeth for 10 days.

Fig 2a: Preoperative clinical image.

Fig 2b: Preoperative palatal view.

Fig 2c: Preoperative IOPA..

Dental history revealed a trauma 8 years back and teeth were treated endodontically followed by a history of orthodontic treatment for 2 years. Presence of granulation tissue on the palatal aspect of the cervical region [Fig 2a,b]. Preoperative radiographs[RVG] revealed a root canal treated irt 11,21 with irregular and mottled appearance in the cervical third of the external root surface at the

mesial aspect of 11 [Fig 2c]. A diagnosis was made for 11 endodontically treated teeth with external cervical root resorption (Heithersay's class III). To know the exact position and extension of the defect, CBCT was advised. According to new classification based on CBCT it was classified as 2Bp{2- Extends into coronal-third of the root and apical to the bone crest (subcrestal), B- > 90° - ≤180°circumferential spread, p- Probable pulpal involvement[Fig 2d,e].

Fig 2d: 3D imaging using CBCT irt 11.

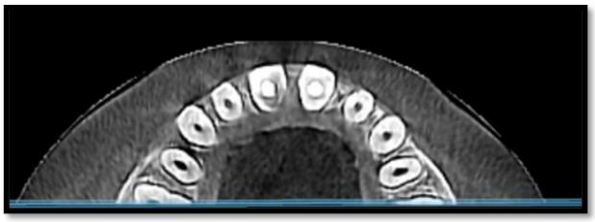

Fig 2e: 3D imaging using CBCT irt 11.

Fig 2f: GP removal done irt11.

Fig 2g: Obturation irt11.

Fig 2h: Diode Laser.

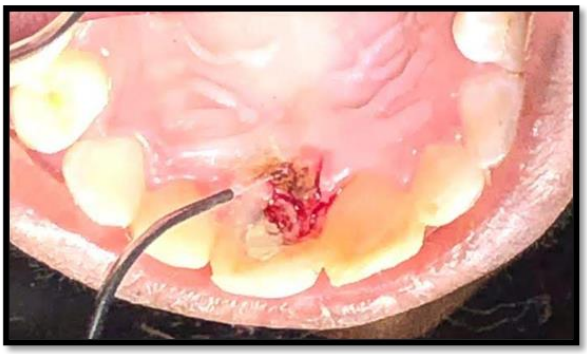

Fig 2i: Granulation tissue removal using laser.

Written informed consent was obtained from the patient. Under local anesthesia, non-surgical re-treatment was initiated in 11 by removing gutta-percha by using protaper retreatment files D1, D2, D3 [Dentsply][Fig 2f]. After Gutta Percha removal, working length determined, and irrigation was performed with 0.9 w/v physiological saline solely,

due to the presence of the root canal perforation and a final rinse with 2% CHX followed by calcium hydroxide dressing given for 1 week.

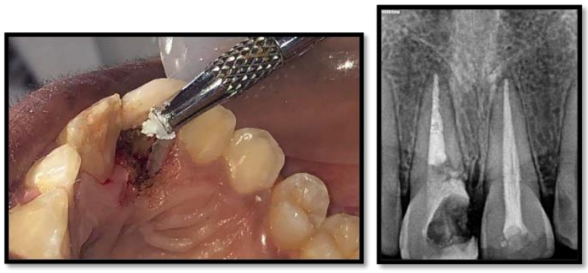

Fig 2j, 2k: MTA placement.

Fig 2l, 2m: Immediate post-operative.

Fig 2n: Six-month post-operative.

Obturation was done using the thermo plasticized obturation technique below the level of resorption defect [fig 2g]. The periodontal reparative surgery was performed immediately after the completion of root canal treatment. Granulation tissue was present on the palatal side, diode laser at 1.5 W - 2.5W for 10-20 s utilizing 300-2000 µm in continuous mode was used to remove granulation tissue [Fig 2h, i]. The resorptive area was treated with 90 % trichloroacetic acid for 30 s. The resorptive area was filled with MTA followed by placement of moist cotton pellet for the setting of MTA and restored temporarily with type 2 Glass ionomer cement [fig 2j,k]. After 24 hrs cotton pellet was removed and restored with a sandwich technique with GIC followed by visible light cure composite restoration Fig 2 l,m].

Clinical examinations were performed for treated teeth after 1,3 and 6 months[Fig2 n]. The patient was completely asymptomatic and probing depth was within normal limits, indicating that repair of resorption defect was successfully performed with MTA.

DISCUSSION

The etiological factor for the cases was the history of trauma and in case 2 along with trauma orthodontic treatment may be the predisposing factor. According to Heitherssay, 15.1% of teeth have a trauma as a major predisposing factor, and when the other contributing factors are associated this increase up to 25.7%. 21.2% of cases may present invasive cervical resorption after orthodontic treatment as a predisposing factor as reported by Heithersay (1999a).[7]

It is essential to diagnose ICR and to distinguish the lesion from internal root resorption by radiographic evaluation.[8] CBCT has been advised in these cases to rule out the type, communication, and position of the lesion. In this case, CBCT was extremely useful in determining the location and extent of ICR, which otherwise would have been difficult to analyze considering only the RVG or IOPA. The present cases can be classified as Class 3 ICR (the communication between the resorption lacuna and the root canal system based on periapical radiograph. But by using new CBCT based classification both cases were classified under different categories.

In the case of case 1, it was classified according to new CBCT classification as 1Ap where the height of involvement is supracrestal, A – indicates circumferential spread is ≤90°,p-indicates pulpal involvement. Based on this classification treatment plan was done. Root canal therapy was initiated and followed by granulation tissue removal was done. As the lesion is supracrestal no flap elevation done. During the debridement of the resorptive lacuna the chemical agent such as 90% trichloroacetic acid (TCA) was used which induces necrosis of the granulation tissue and also has the advantage of hemorrhage control.[9,10] There is a tendency for the

resorption to reoccur, this chemical agent potentially inactivates the resorption cells.[11]

In case 2, CBCT classification as 2Bp where the height is sub crestal with circumferential spread of > 90° - ≤180° and pulpal involvement. According to this treatment plan was done. Diode laser was used in case 2 to remove granulation tissue, research studies have shown that the diode laser was effective when compared to mechanical debridement.[12]Various studies have proven that lasers are effective when compared to mechanical and it also reduces inter appointment pain.[13,14]

In the presented cases, calcium hydroxide dressing was used for 1 week. It activates the undifferentiated progenitor-osteoblasts, cementoblasts, or fibroblasts. High alkaline pH which stimulating the matrix formation by the formative cells. It neutralizes acid products of clastic cells. Ca ions activate ATPase which may then enhance dental tissue mineralization which was reported by Heithersay.[15,16]

MTA is a novel calcium silicate cement, and it can be considered as a valid option since it has superior sealability against bacterial microleakage.[6] Torabinejad M reviewed comprehensive literature to investigate studies regarding MTA and concluded that it has good sealing ability and it seals well by absorbing moisture,[17,18] and also can harden and form a barrier because of hydro-phobic characteristics· MTA is not affected in the presence of moisture and also can harden and form a barrier because of hydro- phobic characteristics

Soundappan S et al. evaluated the marginal adaptability of MTA and biodentine and concluded that MTA has better marginal adaptation.[19] More radiopaque than Biodentine. It stimulates mechanisms responsible for the biomineralization and resolution of periapical diseases.[20]It also has antibacterial and bioinductive properties. Bonson S et al., observed differentiation of fibroblasts and bone formation when MTA was placed on cell cultures of gingival and periodontal ligament fibroblasts. Thus, MTA is considered as a bioactive material with osteoinductive properties and also it is potential to activate the cementoblasts and eventually cementum production.[20]

However, Ozbay G et al. observed less microleakage with MTA then Biodentine when analyzed by fluid filteration method However, Ozbay G et al., observed less microleakage with MTA then Biodentine when analyzed by fluid filteration method Grech L et al., 2013 evaluated biodentine has low washout resistance than MTA. Hence in these cases, MTA was preferred over biodentine.[21]MTA is not affected in the presence of moisture and also can harden and form a barrier because of hydrophobic nature which is place subgingivally. This material does not have sufficient compressive strength, over MTA glass ionomer cement was placed in the second appointment followed by composite restoration.[21]

CONCLUSION

Patients with a history of one or more predisposing factors should be monitored closely for initial signs of ICR. For the best treatment outcome, the clinician should have a very good knowledge of the etiopathology of resorptive lesions as well as knowledge in new diagnostic aids. Early diagnosis and proper treatment in such cases are the key factors that determine the success of the treatment.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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