Combined endo-perio management of subepithelial external root resorption with mineral trioxide aggregate : a case report

Tina Anto[1], Rani Bhargavan[2], Jose Paul[3], Johnson Prakash D'lima[4], Liza George[5], Josey Mathew[6]

[1]Post graduate student
Department of Conservative Dentistry and Endodontics
Annoor Dental College and Hospital, Muvattupuzha.

[2]Post graduate student, Department of Periodontics
Annoor Dental College and Hospital, Muvattupuzha.

[3]Professor and Head of Department
Department of Periodontics
Annoor Dental College and Hospital, Muvattupuzha.

[4]Professor
Department of Periodontics
Annoor Dental College and Hospital, Muvattupuzha.

[5]Professor and Head of Department
Department of Conservative Dentistry and Endodontics
Annoor Dental College and Hospital, Muvattupuzha.

[6]Professor
Department of Conservative Dentistry and Endodontics
Annoor Dental College and Hospital, Muvattupuzha.

Corresponding author

Dr Tina Anto
Post Graduate student
Department of Conservative Dentistry and Endodontics
Annoor Dental College and Hospital, Muvattupuzha
Email: drtinasweety@gmail.com.

INTRODUCTION

Root resorption is a condition associated with either a physiologic or a pathologic process that results in the loss of substance from a tissue such as dentin, cementum or alveolar bone.[1] [American Association of Endodontists]. It may be of 2 types external or internal resorption based on its location on the root surface. Etiology of root resorption can be many (a)inflammatory (b) pressure or (c)replacement resorption.

The process of root resorption involves two phases; injury and stimulation. Damage can beeither mechanical or chemical due to dental trauma, surgical procedure or pressure from an impacted tooth or tumor or usage of bleaching agent, irritating agents, etc. This can lead to crushing and damage of periodontium. Thisdenuded root surface due to loss of precementumis colonized by multinucleated giant cells. The accumulated macrophages and osteoclasts remove damaged PDL and cementum and thus initiate the resorption process.[2] The key cells involved are osteoclasts, odontoclasts, macrophages, and monocytes.

External root resorption is a rare condition in permanent teeth, characterized by progressive loss of tooth substance starting from the external canal wall. It is usually asymptomatic, slowly progressing, and detectable only upon routine radiographic examination. Various etiologic factors have been linked to resorption, including trauma, caries and periodontal infections, anachoresis, cracked teeth, or simply idiopathic dystrophic changes within normalpulp. Spontaneous repair with cementum-like tissue occur if the damaged surface is small. Continuation of active resorption occurs if osteoclastic cells are continuously stimulated due to factors like infection or pressure. Thus identification and removal of causative agent is the critical factor involved in treatment of external root resorption[3].

The external root resorption occurring immediately below epithelial attachment of tooth is most often referred to as cervical root resorption . However, the periodontal attachment of teeth is not always at the cervical margin, leading to the same process occurring more apically on the root surface. The anatomic connotation of its name has led to confusion and misdiagnosis of this condition. Because of this confusion, attempts have been made to rename this type of external and it is referred to as subepithelial external root resorption.[4]

Mineral trioxide aggregate (MTA) (Dentsply) is a biocompatible cement with excellent sealing properties, biocompatibility, good bactericidal effects, radiopacity, and the have the ability to set even in the presence of blood and moisture.[5] MTA is ideal as orthograde or retrograde filling material which has been successfully used in pulp capping, pulpotomy, treatment of traumatized teeth with immature apices, and as a root-end filling material. The use of MTA is a conservative approach to repair resorptive lesions with periodontal communication[6].

This case report describes the treatment of external subepithelial root resorption of a maxillary lateral incisor in which root canal treatment, periodontal surgery, and white mineral trioxide aggregate (MTA) were employed to achieve complete repair of resorptive lesion and to restore function.

CASE REPORT

A 57 year old female patient presented, with chief complaint of pain in her upper right front tooth. Pain was dull, throbbing, intermittent, non radiating type which increase on intake of cold food and relieved after. On clinical examination, a ditch like defect was seen on the mesial surface of 12 both labially and lingually (fig 1). A probing depth 2.5mm was detected clinically and bleeding on probing noted. On probinga generalized pocket of 7-8 mm was noticed, Mesially 8mm, Distally 7mm, Buccal and palatal 5mm. Vitality testing done with EPT showed a delayed response and cold test gave a negative response. The tooth was non tender on vertical percussion and tender on horizontal percussion. The medical history was non contributory.

A preoperative IOPA was made (fig 2) and

showed Radiolucency on the proximal aspect of 12 at the middle third of root involving pulp with no periapical pathology at present. Preoperative OPG was made (fig3). From clinical and radiographic evaluation, a provisional diagnosis was made as External root resorption on the middle third of root extending into root canal space on mesial aspect of 12.

Periodontal status of the tooth was examined. The tooth had Class 1 recession with no trauma from occlusion or mobility and thus prognosis was Fair.

The possibility of conserving the maxillary right lateral incisor was considered through a combination of treatments: nonsurgical root canal therapy to remove the necrotic pulp and disinfect the root canal system, followed by surgical treatment to expose the resorptive defect, and, finally, the filling the resorptive defect with MTA. A stage wise treatment plan was finalized.

- Stage 1: RCT 12 FOLLOWED BY SECTIONAL OBTURATION
- Stage2 : FLAP SURGERY
- Stage 3: SEALING THE LESION USING MTA ANG CLOSURE
- Stage 4: BACK FILLING OF REMAINING ROOT CANAL SPACE

The patient's consent was obtained and root canal treatment was initiated. Anaesthesia was administered accordingly, and the tooth was isolated with a rubber dam. The access cavity was opened using a endo access bur on the palatal surface and the pulp tissue was removed (fig 4). Working Length determination was performed electronically using the DentaPort ZX (J. Morita Manufacturing) and confirmed radiographically(fig 5). During root canal instrumentation, a communication between the resorption cavity and the distal periodontium was observed as an haemorrhagic area. The canal was prepared upto #30 k file and step back was done # 45k file. Intracanal irrigation was performed with 5.25% NaOCl and calcium hydroxide paste placed to alkalinize the environment, remove remaining pulp tissue, control bleeding at the perforation, and assure the complete elimination of the granulation tissue.

After 15 days, the dressing material was removed with 1% sodium hypochlorite irrigation and the root canal dried with paper points. A #30 Matercone was selected (fig 6) and was used to fill the apical root canal with a down-pack motion. The access cavity was temporarily sealed with Cavit .

Surgical intervention was planned. First hematological investigations were done followed by thorough oral prophylaxis .The surgical procedure was performed under local anesthesia (Lignocaine with adrenaline in the ratio of 1:80,000 by weight). Crevicular or sulcular incision was placed extending from distal side of right central incisor to mesial side of right canine by using Bard-Parker handle with a no.15 blade (fig 7). Vertical releasing incisions were placed from distal side of right maxillary central incisor beyond to the muco gingival junction and also from mesial side of right maxillary canine beyond to the muco gingival junction. Full thickness mucoperiosteal flap was reflected (fig 8). A circular resorptive area was seen clearly from the surgical site (fig 9). Granulomatous tissue was removed from the surgical site efficiently. The area of cavitation possessed hard dentin borders and was modified with burs to remove the irregular edges. After isolation of the area with cotton pellets MTA was prepared according to the recommendations of the manufacturer. MTA was inserted into the dried cavity with a plastic instrument and allowed to set for 10 minutes (fig 10) and confirmed radiographically (fig 11). The gingival tissue was stabilized using simple interrupted sutures (fig 12). After that periodontal pack was placed [Coe-pack] (fig 13).Patient was prescribed antibiotics [Amoxicillin 500mg thrice daily for 5days and analgesics [Meftal forte thrice daily for three days]. Asked the patient to rinse with 0.2%chlorhexidine mouthwash for two weeks. Patient was reviewed after 1 week for suture removal and afterwards, the provisional restoration was removed and remaining root canal space was obturated using back-

filling technique. An immediate postoperative radiograph was taken, confirming satisfactory filling of the root canal and resorptive defect.(fig 14).[3] month follow up done (fig 15). Patient is under regular follow up and is asymptomatic.

DISCUSSION

RR is one of the most difficult dental conditions to treat and may require a multi disciplinary approach. Endodontic therapy of the affected tooth is futile as per previous studies.[7]

The sub-epithelial form of external root resorption is a rare variant and its pathosis is not fully understood. Its histological appearance and progressive nature is identical to other forms of progressive inflammatory root resorption, it appears logical that the pathogenesis would be the same (i.e. an unprotected or altered root surface attracting resorbing cells and an inflammatory response maintained by infection).[8] Causes of the root damage immediately below the epithelial attachment of the root include orthodontic tooth movement, trauma, non-vital bleaching and other less definable cause.[9] The pulp plays no role in cervical root resorption and is mostly normal in these cases. Because the source of stimulation (infection) is not the pulp, it has been postulated that it is the bacteria in the sulcus of the tooth that stimulate and sustain an inflammatory response in the periodontium at the attachment level of the root. This theory is strengthened by the fact that bone resorption similar to marginal periodontitis will always accompany this type of root resorption[10].

Three dimensional sealing of the root canal is one of the principle goals of endodontic treatment and is essential for preventing apical and coronal leakage in the root canal system. A recent trend in endodontic research is to explore various alternatives to Gutta-percha to identify suitable filling materials that can provide greater resistance against coronal and apical leakage and thus protection from bacterial contamination.[11] Development of some bioactive material such as MTA makes possible other therapeutic approaches including the obturation of root canal space in complex cases of pathologic root resorption.[12] One of the characteristics of bioactive material is its ability to form an apatite like layer on its surface when it comes in contact with physiologic fluids in vivo or with stimulated body fluid in vitro[13]. MTA is a bioactive material that is mainly composed of tricalcium and silicate. Investigation has shown that it can conduct and induct hard tissue formation.[14]

Antibacterial activity of MTA seems to be associated with elevated pH. Torabinejad et al. observed an initial pH of 10.2 for MTA rising to 12.5 in 3 hours, it is known that pH level in order of 12.0 can inhibit most microorganisms including resistant bacteria such as Enterococcus faecalis.[15]

In addition to its well documented biocompatibility the production of bone morphogenic protein-2 and transferring growth factor beta-1 could be two important contributors to the favorable biologic response stimulated MTA in periapical tissues. It is also shown that the stimulation of interleukin production by MTA may influence the over growth of cementum and facilitates the regeneration of periodontal ligament and formation of bone.[16]

Recent studies have reported on the success of filling resorptive defect with MTA ranging from 76.5% to 91%.[17]

Over the years, many materials have been used as retrograde filling substances such as Amalgam, IRM, Super EBA, Glass Ionomer Cement, Composites, Optibond, Geristore, and most recently, MTA. One of the newest materials being used and assessed worldwide is Biodentine.

In the present case, MTA was used to repair the defect as there is evidence from literature to suggest that periodontal reattachment is possible. In 2009, Heithersay GS[18] reported that MTA can make adequate preparation for a biocompatible surface for the possible adhesion or attachment of bone and cementum.

Torabinejad et al 200312 suggested that moisture from the surrounding tissue acts as an activator of chemical reaction in this material. In 2004, he also described that MTA is not affected in the presence of moisture and blood and it is able to harden and form a barrier because of its hydrophilic characteristics. So in this case, along with flap surgery MTA is used as a filling material to restore the resorbed area.

In 2009, Hakki et al[19] demonstrated that MTA does not have a negative effect on the viability and morphology of cementoblasts and induced bio mineralization of cementoblast. Perinpanayagam H, Al-Rabeah E 200920 revealed that MTA surfaces supported osteoblast cell attachment that is essential for osteogenesis. But in this study, no histological sections were observed, so it is difficult to conclude that true regeneration has occurred.

Holland R 200121 and Ford TR 1995 showed that MTA was used as a barrier between the root canal space and furcal perforations. By using MTA favorable healing demonstrated in root and furcal perforation.

Camilleri et al. 2006 22observed that the production of calcium hydroxide as a byproduct of the hydration reaction of MTA. Hollend et al 200121 postulated that the biological response and the mechanism of action of MTA had been found similar to that of calcium hydroxide. It has been reported that MTA released calcium ions and promoted an alkaline pH, the physicochemical basis for the biological properties of MTA had recently been attributed to the production of hydro xyapatite when the calcium ions released by the MTA came into contact with tissue fluid.

Torabinejad et al. (1995)23 reported that when MTA react with water, it has two specific phases composed of calcium oxide and calcium phosphate. Calcium oxide react with tissue fluids to form calcium hydroxide which can form calcite crystals. So MTA provides biologically active substrate for bone cells. It is possible that these crystals and the condensed fibronectin are biologically active substrate that MT A offers.

Koh et al. 1998 24 studied the cyto morphology of osteoblasts in the presence of MTA and observed cytokine production. Scanning electron microscopy revealed healthy cells in contact with MT A at 1 and 3 days and also the presence of elevated levels of interleukins.

Biodentine has also been developed as a favorable repair material due to its bioactivity and biocompatibility. It has setting time of less than 12 min and high mechanical properties with excellent sealing ability. Its property to release calcium ion and enhancing the alkaline environment makes Biodentine more conducive for osteoblastic activity.[25]

Caron et al. 201426 performed two endodontic microsurgeries using specific armamentarium under high power magnification with an operatory microscope. Biodentine was used as a root end filling and they observed that the two cases had completely healed at 1 year and were followed for 1 more year. Their 2 year follow up connecting the previous observation with the absence of clinical symptoms and radiographic evidence of regeneration of the periapical tissues.

In this study, MTA was the choice of material to fill the resorptive defect in the canal due to its high success rate. MTA is proved to be the material of choice as it leads to avoidance of surgical treatment with similar prognostic outcome. Further long-term clinical studies should be encouraged.

CONCLUSION

The endodontic treatment is incomplete if the resorptive defect is not eliminated and the restorative aspects are not managed properly. Adequate management requires knowledge and skills in endodontics, surgery, periodontology and restorative dentistry

Figure 1

Figure 2

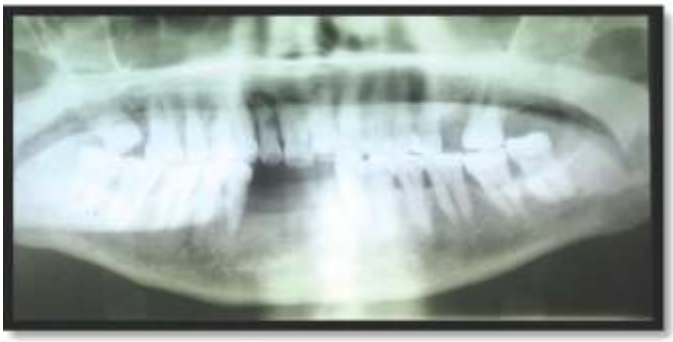

Figure 3

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Figure 14

Figure 13

Figure 15

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