

# Mineral Trioxide Aggregate in Aggressive Dental Resorption : A Case Report

AKM Bashar<sup>1</sup>, Begum Rokeya Afsar<sup>2</sup>, Md. Shamshul Alam<sup>3</sup>

<sup>1</sup>Assistant Professor, Dept. of Conservative Dentistry & Endodontics, Bangabandhu Sheikh Mujib Medical University, <sup>2</sup>Dental Surgeon, Sonargoen Upzilla Health complex, Narayangang, <sup>3</sup>Professor & Chairman, Dept. of Conservative Dentistry & Endodontics, Bangabandhu Sheikh Mujib Medical University

## Abstract:

The study was carried out to evaluate the clinical efficacy of Mineral trioxide aggregate (MTA) in arresting dental resorption and as a regenerative material especially for growth of bone and periodontal ligament. Tooth no 25 having Aggressive Dental Resorption (simultaneous presentation of apical and lateral perforating resorption) with discharging sinus and co-existing oral communication through periodontal pocket was treated with MTA. After thorough debridement and disinfection of the root canal, complete obturation of the root canal system was done with MTA and evaluated thereafter. Follow up examinations up to a period of 1 year could not reveal resolution of any of the preoperative signs and symptoms i.e. discharging sinus, periodontal pocket healing and mobility; also did not show radiographic evidence of arrest of resorption and bone or periodontal tissue formation. Clinical efficacy of MTA in arresting dental resorption with subsequent repair found questionable. However, Shorter period of disinfection, co-existence of oral communication with the resorptive defects through periodontium and non surgical treatment approach all or any one of these may be the concern for the failure.

**Keywords:** Resorption, Perforation, MTA.

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## Introduction:

When the apical portion of the root is resorbed so severely by external or internal resorption, biological apical limit of the canal disappears. Then it becomes impossible to achieve a fluid tight seal in these cases with the traditional filling technique due to the inadequacy of apical stop.<sup>1,2</sup> Resorption, if remain untreated, also can perforate tooth structure and create a communication between root canal and the periodontium. If resorption is of extremely large dimension with perforation, it may contraindicate endodontic therapy as it makes successful treatment impractical.<sup>3</sup>

For the non surgical treatment of radicular resorptive perforation, following clastic cell removal and subsequent canal sterilization, long term calcium hydroxide intracanal dressing has been recommended to arrest the resorption process.<sup>4</sup> But, several intracanal dressing sessions using calcium hydroxide paste to induce apical barrier formation for compaction of obturation material, as advocated by Frank and Weine<sup>3</sup> is believed to have further weakened the remaining root structure. Andreasen et. al. demonstrated that apexification treatment for 1 year with calcium hydroxide reduces the fracture resistance of the immature pulpectomized tooth by 50%.<sup>5</sup>

Mineral trioxide aggregate (MTA), since its introduction, has represented an extraordinary breakthrough for managing radicular repairs.<sup>6-8</sup> It is an aggregate of Dicalcium silicate, Tricalcium silicate, Tricalcium aluminate, Bismuth oxide, Calcium sulfate dihydrate and trace elements,<sup>9</sup> In cases of perforation repair, it can be used either as the sole restorative material or as a nonresorbable barrier against which to pack another material.<sup>10</sup> MTA has been claimed to be effective in dealing dental resorption involving root repair and bone healing along with its many other reputable applications.<sup>11</sup> On hydration, the predominant silicate components of the fine hydrophilic particles produce a silicate hydrate gel and calcium hydroxide.<sup>9</sup> The hydrated gel with a pH of 12.5 sets to a hard mass in approximately 4 hours thereby facilitate immediate repair of the perforation and barrier formation for obturation of the root canal.<sup>11,12</sup> Various researchers have reported the clinical success of MTA as a repair material over the other traditional materials. It has also been claimed as the only material that consistently allows for the overgrowth of dentin, cementum & bone and facilitates the regeneration of the periodontal ligament.<sup>13-16</sup> Thereby MTA may be a promising alternative and the material of choice in dental resorption especially when there is a communicating perforative resorption that requires both arrest of resorption as well as regeneration of periodontal bone and ligament. The aim

**Correspondence to :** Dr. A.K.M. Bashar, Assistant Professor, Dept. of Conservative Dentistry & Endodontics, Room no.425, 3<sup>rd</sup> floor, Block A, BSMMU, E-mail: basharakm@yahoo.com

of the study is to evaluate clinical efficacy of MTA as a disinfective material, in arresting dental resorption and finally as a regenerative material especially for growth of bone and periodontal ligament.

### Case Report:

A 17-year old patient, attended at the department of Conservative dentistry & Endodontics, BSMMU with a complain of intermittent swelling and pus discharge from the gingival area around tooth no 25. He was thoroughly interrogated and examined following a predetermined pre-operative data sheet. Clinical examination revealed slight buccally displaced left upper 1st premolar with a visible sinus opening at the vestibule against involved tooth through which, on expression, pus discharged (fig 1&2). Poor oral hygiene condition was detected having moderate amount of calculus with varying depths of periodontal pockets. Depth of the periodontal pocket around the distal surface of the affected tooth was approximately 8 mm (fig 3 & 4). The patient could not recall any relevant traumatic episode. Intra oral periapical radiograph showed short root having a blunted and open apex with associated periapical radiolucency that mimicked with wide alveolar bone resorption. Another wide oval shaped radiolucent area occupying the coronal half of the root was found to be extended towards distal surface communicating the larger defect (i.e, radiolucent area) with the external surface of the tooth (fig 5). Wider periodontal area communicating oral cavity with the resorptive area was also evident radiographically. Due to the extent of the resorption and the lack of an apical stop, MTA was selected as an alternative root canal obturation material and at the same time as a resorption repair material.

After the routine periodontal prophylaxis of scaling and curettage, access cavity was prepared on the particular tooth. Wide apical area due to resorption could be visualized through access cavity (fig 6). Now following confirmation of the working length, canal was thoroughly debrided and calcium hydroxide paste was placed within the canal for one week. MTA powder and distilled water was mixed in a thick consistency and transferred to the canal incrementally with an amalgam carrier. Bit by bit condensation was done by the Schilder pluggers of appropriate length up to the apical limit and perforating resorptive defect of the canal to facilitate the induction of hard tissue barrier formation and also to ensure proper adaptation of the material with the canal wall creating a three dimensional obturation.(fig 7,8,9) Verification of the condensation was done by radiographs.(fig 10) A damp cotton pellet was placed in the access cavity and it was closed with provisional restoration. Final restoration was done after 1 week with Glass ionomer cement. Oral hygiene instructions were given. Patient was recalled weekly for two weeks and then monthly for 12 succeeding months. Appearance of intra or extra oral swelling, pus discharge, tooth mobility, radiographic evidence of periradicular bone and tissue loss, and periodontal condition were assessed periodically. After 1 year recall evaluation, there were no complete resolution of any of the preoperative clinical features. The stoma of the sinus still persisted and the periodontal pocket depth and tooth mobility did not improve. Radiographic improvements of radiolucency also could not be detected. Evaluation of clinical efficiency of MTA as was found in the present study is shown in Table I.

**Table-I**  
*Evaluation for the clinical efficacy of MTA*

Study parameter	Pre-operative status	Post operative status after 1 year	Clinical evaluation
Intra-oral swelling	Intermittent	Not developed with 1 year	Successful
Discharging sinus	Spontaneous discharge of pus	Stoma of the sinus still persist, intermittent pus discharge on expression	Failure
Tooth mobility	Present (Grade 1)	Present (Grade 1 )	Doubtful
Radiographic evidence of periradicular bone and tissue loss	Wide radiolucent area present	No improvement detected on comparison	Failure
Periodontal condition	8 mm deep Perio- pocket communication between oral cavity with the resorptive area was present	No change in pocket depth, no improvement	Failure

**Successful** means MTA is effective, **Failure** represents MTA is not effective **Doubtful** indicates no change or condition that does not reflect efficacy



**Fig.-1:** Pre-operative figure showing slight buccal displacement of the upper first premolar.



**Fig. -2:** sinus opening on the buccal vestibule against tooth no 25.



**Fig. -3:** mirror image of the deep perio-pocket on the distal surface



**Fig.-4:** mirror image showing resorptive lateral perforation sight exposing to the oral environment



**Fig.-5:** radiograph showing too short root with blunted open apex, periapical radiolucency mimicking wide alveolar bone resorption, oval shaped radiolucent area occupying the coronal half of the root and extending towards distal surface that denotes perforating resorption. Wider periodontal area communicating oral cavity with the resorptive area was also evident radiographically.



**Fig.- 6:** wide apical foramen due to resorption was visible through access cavity.



**Fig. -7, 8, 9:** Showing sequential packing and plugging of the root canal with MTA



**Fig. -10:** post operative radiograph showing obturated canal, lateral and apical perforating resorptive area on tooth no 25 associated with a periapical radiolucency



**Fig. -11:** Follow up radiograph after 1 year showing no definite radiological evidence for improvement

#### Discussion:

Since MTA that had postulated many times subsequent mechanisms of the radicular repair and the apical barrier formation,<sup>17-19</sup> resolution of the clinical symptoms and arrest of resorption was also expected in our patient. But dissimilarities in case selection between those patients and

the patient we have treated may be a reason for failure. In contrast to our patient, no sinus tract was present, probing depths were not greater than 4 mm and it was not possible to probe into the resorptive defect through the sulcus.<sup>20,21</sup> Dissimilarities were found in treatment protocol also. Besides using calcium hydroxide as an intracanal disinfectant, those patients were also treated with long term (4month-1 year) calcium hydroxide intracanal dressing to arrest the resorption process before repairing the resorption defect with MTA.<sup>21,21</sup> This is in contrast with our patient, in which case we have used calcium hydroxide as an intracanal disinfectant for 1 week only before canal obturation by MTA. Before MTA application, one week intracanal calcium hydroxide dressing has been justified only for the necrosis and tissue dissolution in the foramen and perforation areas.<sup>17</sup> In case of our patient, prior to MTA obturation, intracanal calcium hydroxide dressing was hence applied for 1 week and the post operative radiographic examination also revealed adequate sealing of the root canal and the perforation site. Hence, similar biocompatibility and hard tissue induction events of other cases were also expected to take effect adjacent to the material from the 1st postoperative week.<sup>22</sup> But in an environment of noncommunicating periapical infection as in apexification, MTA although exhibited its antibacterial and inductive capacities<sup>3</sup> but it could not resolve the periradicular infection having persistant communication with the oral environment like our patient. In spite of canal disinfection and adequate sealing by MTA, maintenance of periradicular infection through the persisting communication along the periodontal space may be the factor impeded periodontal healing.

In apexification cases, where MTA is used as an apical plug, obturation of the radicular space usually requires laterally condensed gutta-percha or thermoplasticized gutta-percha. But, the radicular perforation and the extensive nature of both apical and lateral resorption of present study compromised the structural integrity of the tooth and thus warranted MTA to be used as an alternative

root canal obturation material.<sup>8,20</sup> The hard tissue inductive effects of MTA were believed to be useful in not only the tooth's apical region, but also in the areas of perforating resorption.<sup>23</sup> Therefore, due to the importance of periodontal complex healing and maintenance of an aseptic root canal system, complete MTA obturation was implemented.

### Conclusion:

Failure in the resolution of preoperative clinical features even after 12 months has turned the potentiality of MTA in arresting dental resorption into an uncertainty. However, Shorter period of disinfection, co-existence of oral communication with the resorptive defects through periodontium and non surgical treatment approach all or any one of these may be the concern for the failure. Simultaneous correction of oral communication and the resorptive defects by surgical measures may elicit the role of MTA in these cases of resorption. Further studies are necessary for proper evaluation.

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