ROLE OF MINERAL TRIOXIDE AGGREGATE: IN PERIODONTAL REGENERATION OVER ROOT RESORPTION AREA - A CASE REPORT

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Mineral Trioxide Aggregate (MTA) is a recent restorative material. It has shown a very good potential as a reparative material for perforation because of its biocompatibility, regenerative capacity and excellent sealing ability. A cementum-like material has been consistently shown to grow directly on the material after placement. Due to these properties, it was attempted to seal the resorption site on a tooth root of # 21, having perio-endo lesion in a 44-year old patient.

Patient had non-vital # 21 due to trauma one year back. After biomechanical preparation, open flap debridement was planned. During surgery, resorption site was sealed with MTA. Osseous graft and collagen membrane were placed over it. Post surgically, after initial recession, there was gingival creeping associated with evident increase in the crestal bone height radio graphically.

Henceforth, a case of external root resorption communicating the periodontal pocket with the pulp space leading to perio-endo lesion and its management is presented.

Keywords: Root resorption, Periodontal Regeneration, Perio-Endo lesion Mineral trioxide aggregate (MTA)

INTRODUCTION

External root resorption leading to communication between periodontal ligament and pulp space produces a complicated situation and a challenge to the clinician for its management. It is characterized by a radiolucent zone on the radicular area. There may be various predisposing factors for external resorption like trauma, infection, and iatrogenic exposures.[1,2]

As external resorption is extended to the pulp space of root, it leads to primary periodontic and secondary endodontic lesion. Management of such perio-endo lesions requires endodontic treatment, periodontal treatment and sealing of resorption area. There are various sealing materials available e.g. Amalgam, Glass ionomer cement and recently introduced Mineral trioxide aggregate (MTA). Nowa-days, MTA is considered to be the most suitable agent as sealing material because of its biocompatibility, helping in cementogenesis and osteogenesis and excellent sealing ability.[3,4,5,6] It is a hydrophilic cement consisting of various oxides like calcium oxide, silicon dioxide, bismuth oxide and helps in the formation of cemental layer over the sealed area. Bone regeneration was also observed adjacent to the sealed area.[7,8]

In this present case MTA was used as a sealing material for repair of localized external root resorption, in association with bone graft and GTR membrane in an attempt to regenerate the lost periodontal tissue and enhance the prognostic value of treatment.

CASE REPORT

A 44-year-old male patient reported in the outpatient department, Periodontics, Kothiwal Dental College and Research Centre, Moradabad, with a complaint of continuous and dull pain in upper left

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front teeth region since last one month. The patient had a history of trauma. He had met with an accident two years ago. His medical history was non-contributory.

On clinical examination of the left maxillary anterior region, it was noted that the left central and lateral incisors, #21and #22, were tender to percussion. The teeth were unresponsive to sensitivity test with cold and electric pulp tester (Parkell, Farmingtale, NY, USA.). There was grade II mobility and marginal gingival recession varying from 2-3mm at different surfaces of #21.There was pocket all around the #21 varying from 5-8mm, deepest (8mm) on its distolabial aspect (Fig.-1).

Radiographic examination revealed an apparent radiolucency at the junction of middle and cervical third of root of #21 on the distal aspect and noticeable reduction in the crestal bone height up to the apical extent of the resorption (Fig.-2). No hematological abnormalities were found on laboratory investigations.

The case was thus diagnosed as perio-endo lesion involving #21 and endo lesion in #22. The treatment plan was constituted comprising of root canal treatment, sealing of resorption site with MTA and management of pocket attempting regeneration with osseous graft and GTR membrane in #21 and root canal treatment in #22. An informed consent was obtained from the patient.

Root canals of #21 and #22 were negotiated and after biomechanical preparation, #22 was obturated. Calcium hydroxide was placed in the canal of #21 to make it sterile and dry.

A week later, after application of local anaesthesia, sulcular incision was given, and mucoperiosteal flap was raised. A clear-cut resorptive area, approximately of 4mm in diameter, communicating to pulp space was found on the distolabial aspect of #21 (Fig.-3a, 3b). After thorough debridement, isolation and desiccation, resorption area was sealed with paste consistency of MTA in sterile water (Pro Root® MTA, Dentsply, Maillefer, Switzerland) following the manufacturer's instruction, in small increments with a small plugger. MTA was gently packed against the dentinal wall (Fig.-4). Bone graft (R.T.R, Septodont, France) and GTR membrane (Bio-Guide®, Geistlich pharma AG, Switzerland) were placed over MTA sealing (Fig.-5a, 5b). Flap was sutured and Coe-pack™ (GC America Inc. Alsip, IL, USA) was secured over it. The patient was advised to take Amoxicillin- 500mg (1×3), Ibuprofen- 400mg (1×3), multivitamin (1×1) and 0.2% Chlorhexidine (CHX) mouthwash twice daily for 5 days. Patient was then recalled after three days for final root canal obturation in #21. He was clinically asymptomatic and asked to report after ten days.

After 10 days Coe-pack and sutures were removed. At this point of time an increase in gingival recession measuring approximately 5mm was noticed. Patient was asked to use super-soft (Plakoff®-ICPA) brush gently, continue CHX mouthwash and to report after one month.

After one month, patient was completely asymptomatic. There was reduction in gingival recession measuring approximately 3mm. Patient was followed up 6 months later. On re-evaluation it was observed that visible recession was stable at 3mm level and pocket depth was reduced to 3mm (Fig.-6). Patient was advised to maintain the proper oral hygiene and to report after next six months. Observation, 6 months later, showed healthy gingivae. Radiographic evaluation revealed significant increase in height of alveolar crest on distal aspect of #21 covering the MTA seal (Fig.-7).

DISCUSSION

Mineral trioxide aggregate (MTA) was developed at Loma Linda University in the 1990s as a root-end filling material. It received acceptance by the US Federal Drug Administration and became commercially available as ProRoot MTA (Tulsa Dental Products, Tulsa, OK, USA).[9]

The production of calcium hydroxide as a byproduct of the hydration reaction of MTA has

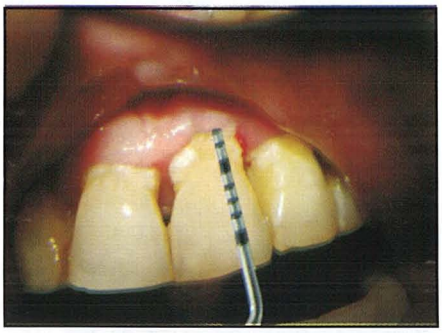


Fig. 1: Preoperative view showing apparent recession and pocket in relation to #21.

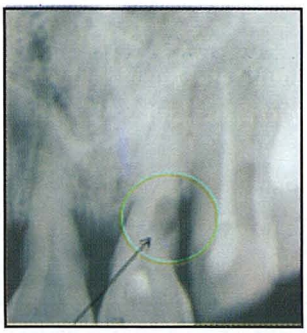


Fig. 2: Preoperative radiopgraph showing radiolucency at the junction of cervical and middle third of root with reduced crestal bone height at the distal aspect of # 21. Root canal obturation in # 22.

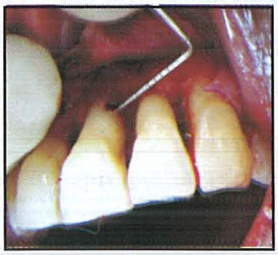
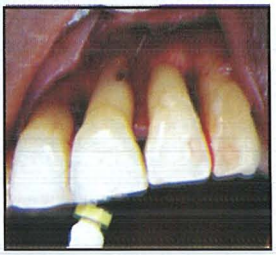


Fig. 3a: Raised mucoperiosteal flap showing resorption site.



3b: Clearcut resorptive area at the distal aspect of #21 and K file passing through the resorption site.

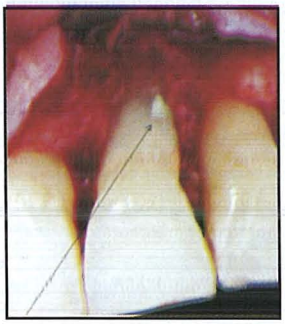


Fig. 4: Resorptive area sealed with MTA.

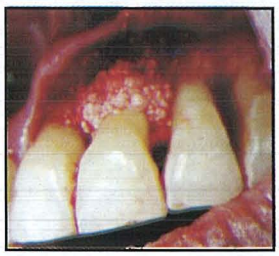


Figure-5a : Bone graft covering the defect.

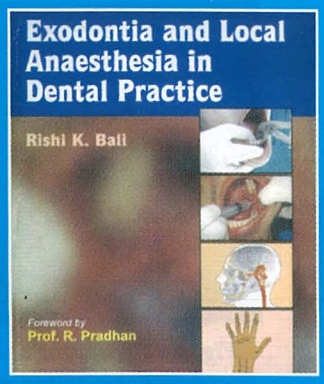


5b: GTR membrane covering the defect.



Fig. 6: 1-year postoperative reduction in pocket depth.

Book Reviews



Title: **Exodontia and Local Anaesthesia in Dental Practice**

Author: **Dr. Rishi K. Bali**

No. of Pages: 166

Price: Rs. 295.00

Publisher: **Arya (MEDI) Publishing**

4805/24 Bharat Ram Road House

Daryaganj, New Delhi – 110 002

Website: www.aryamedipublishing.com

Author has made efforts to cover the important aspect of Dental Practice, The Exodontia and Local Anaesthesia in concise form for the benefit of undergraduate Dental students. The Book is in form of handy notes given in three sections namely Exodontia (12 chapters), Local Anaesthesia (8 chapters) and a section on Multiple choice questions on the subject (195 MCQ's with Answers).

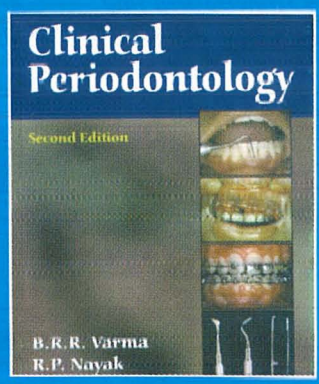
However, supplimental reading on the subject need not be over emphasised.

Printing and the get up of the book is good.

Reviewed by: Prof. (Dr.) V.P. Jalili

Director P.G. Studies & Research

Modern Dental College & Research Centre, Indore



Title: **Clinical Periodontology (2nd Edition)**

Author: **Dr. B.R.R. Verma and Dr. R.P. Nayak**

Price: Rs. 525.00

No. of Pages: 472

Publisher: **Arya (MEDI) Publishing**

Figures and Illustration: 184

4805/24 Bharat Ram Road House

Daryaganj, New Delhi – 110 002

Website: www.aryamedipublishing.com

Author Prof. B.R.R. Verma and Prof. R.P. Nayak have made good efforts to bring out a text book in Clinical Periodontology for the undergraduate students taking care that it cover the undergraduate syllabus in vogue, written in a simple English, easy to understand by a BDS students. Text is supported by figures and illustrations wherever necessary.

Second edition is an updated and revised version over the first one including the valuable suggestions received from fellow periodontists. New chapter like immunology and inflammation, Halitosis, periodontal diseases in children and medical emergencies in dental office, recent advances in periodontolgy and periodontal care of medically compromised patients have been included.

It is a good textbook in Periodontics for BDS students as well as for the practitioners.

Reviewed by: Prof. (Dr.) V.P. Jalili

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Figure-7: Radiograph after 1 year showing gain in crestal bone height over MTA seal.

been observed (Camilleri et al. 2006).[9] The biological response to MTA had been found similar to that of calcium hydroxide (Holland et al. 1999a)[7] and it was postulated that the mechanisms of action were similar to that of calcium hydroxide (Holland et al. 2001).[10] 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 hydroxyapatite when the calcium ions released by the MTA came into contact with tissue fluid.

According to Torabinejad et al. (1995), after the reaction with water, MTA has two specific phases composed of calcium oxide and calcium phosphate. So, MTA does not have calcium hydroxide, but has calcium oxide that could react with tissue fluids to form calcium hydroxide which can form calcite crystals.[11] So, MTA provides biologically active substrate for bone cells.[8] It is possible that these crystals and the condensed fibronectin are biologically active substrate that MTA offers. Seux et al. observed the role of calcite crystals and fibronectin as an initial step in the formation of a hard tissue barrier.[12]

Koh et al. studied the cytomorphology of osteoblasts in the presence of MTA and examined cytokine production. Scanning electron microscopy revealed healthy cells in contact with MTA at 1 and 3 days and also the presence of raised levels of interlucine.[13] Supportive views behind these findings were that most of the studies showed good cell growth over MTA with the formation of a cell monolayer over the material.[14] MTA allows growth of cementum and periodontal ligament (Schwartz et al. 1999)[15]. Presence of cementum on the surface of MTA was a frequent finding (Torabinejad et al. 1997).[16]

Torabinejad et al., Pitt Ford TR and Holland Roberto have observed that MTA actively promotes hard tissue formation rather than being inert or an irritant. The condensation of fibronectin around the formed apatite crystals permits cellular adhesion and differentiation seen as cementoblast in the periodontium.[16, 17] Thomson et al. have found that osteocalcium levels were also increased in the presence of MTA.[18]

MTA also preferentially induced alkaline phosphatase expression and activity in both periodontal ligament and gingival fibroblast (Bonson *et al.* 2004).[19] One year post operative findings, in the present case, also shows increase in the radio-opacity over alveolar crest which is probably due to formation of periodontal tissue. The osseous graft acted as scaffold and GTR membrane occluded the ingrowth of epithelium helping the regeneration of cementum as well as bone over the root resorption site sealed with MTA.

CONCLUSION

This clinical case demonstrates that in the wide arena of perio-endo lesion, MTA may be used as a repair material for root perforation due to root resorption. MTA has been proved to be the material of choice due to its biocompatibility, regenerative capacity and excellent sealing ability. MTA, when used as reparative material along with bone graft and GTR membrane to correct perio-endo lesion, gives a very promising result. The histological investigation in experimental models is required to establish the structure and pattern of newly regenerated periodontal tissue.

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PROF. J.G. KANNAPPAN AWARDED

During the recent Diamond Jubilee celebrations of Dental Council of India, held at Chennai on 30th January 2010, Prof. Dr. J.G. Kannappan president of IAFO was presented an award in recognition of his services rendered to the dental education and dental services in India, by Hon Deputy Chief Minister of Tamil Nadu, Thiru M.K. Stalin. Prof. J. G. Kannappan is recipient of Dr. B C Roy Award and Hari Om Ashram Alembic research award from the Medical Council of India. He is also recipient of first Medical Tansa award from The Tamil Nadu State Council for Science and Technology. He is an author of medical books in English, Tamil and Hindi.

