Case Report

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MANAGEMENT OF OPEN APEX IN INCISORS ASSOCIATED WITH LARGE PERIAPICAL LESIONS USING MINERAL TRIOXIDE AGGREGATE

Roy Thomas[1],Sanjay Rastogi[2],Mansi Bansal[3]
1.Consultant and Professor,Private Practice,Kerala, India
2.Reader,Dept. of Oral and Maxillofacial Surgery,IDS,Bareilly, Uttar Pradesh,India
3.Reader,Dept. of Periodontolgy,IDST,Modinagar, Uttar Pradesh,INDIA

ABSTRACT:

Pulpal and periradicular pathosis are the result of microbial, mechanical, or chemical invasion. Microorganisms are the main irritants of pulpal and periapical tissues. The goal of the obturation is to obtain a fluid-tight seal of the root canal system from its coronal aspect through its apical extent to preserve from the irritants.. Root apices have morphological irregularities in teeth with periapical lesions. Therefore, it is more difficult to produce hermetically apical stop with conventional gutta-percha obturation techniques. Also.apexification with calcium hydroxide is associated with certain difficulties, such as the very long treatment time required, the possibility of tooth fracture, and incomplete calcification of the bridge. Use of an apical plug is an alternative treatment for open apices, and this has gained popularity in recent years, employing mineral trioxide aggregate (MTA) for optimal results. We report successful treatment of 3 clinical cases of teeth with open apices and associated peri-apical lesions which were successfully treated with the mineral trioxide aggregate. A four year follow up demonstrated a clinically asymptomatic and adequately functional tooth, with radiological signs of healing. Considering the importance of a coronal seal, the use of MTA for apical plugging appears to be valid option.

Key words: Apexification, Mineral Trioxide Aggregate, Apical Plug, Periapical Lesion

INTRODUCTION:

The major challenges associated with endodontic treatment of teeth with open apices are achieving complete debridement, canal disinfection and optimal sealing of the root canal system.[1] In the absence of a natural apical constriction, the production of mineralized tissue in the apical region is important to create an apical barrier and allow 3-dimensional adaptation of obturating material within the root canal system. Calcium hydroxide has been commonly used as an intracanal dressing to induce hard tissue deposition in necrotic teeth with open apices. [2] The time needed to form an apical barrier is unpredictable and depends on the size of the apical foramen, the presence of infection and the host.[2,3]

MTA has proven to have several potential clinical applications due to its superior sealing property, ability to set in the presence of blood, [4] bactericidal effects,

*Corresponding Author Address: Dr. Sanjay Rastogi,Reader,Dept. of Oral and Maxillofacial Surgery,IDS,Bareilly, Uttar Pradesh,India. Email: docos79@gmail.com

and biocompatibility [5] and new cementum formation.[6] Mineral trioxide aggregate (MTA) is a powder consisting of fine hydrophilic particles that bind in the presence of moisture. Set MTA provides a good seal and excellent marginal adaptation.[7] In vivo studies have confirmed biocompatibility of this material and have shown a hard tissue inductive effect.[7,8] MTA can be used as an apical plug allowing for prompt obturation of the root canal.[9-11]

Torabinejad and Chivian [12] have suggested the use of MTA as an obturating material for the entire root canal system. O'Sullivan and Hartwell [13] used MTA as filling material in the treatment of retained primary molar tooth and informed that technique seemed to provide a biocompatible seal of the root canal system in that case.

We present 3 clinical cases of teeth with open apices and associated peri-apical lesions which were successfully treated with MTA during a 4 year follow-up.

CASE DETAIL:

A 9yr old girl complained of having pain and swelling in her upper left central incisor. Clinical examination revealed a fracture with an abscess around its apex. No mobility was seen. The colour of the tooth did not differ from that of the adjacent teeth. There was no response to vitality testing. The peri-apical x-rays showed a large radiolucent lesion around the apex of the left central incisor. It also revealed that the apex was incompletely formed. ***Fig.1***

A non surgical endodontic treatment was planned for the tooth. Initial treatment included preparing the access for the incisor, at which point a pale yellowish exudate became apparent.

The canal system was copiously irrigated with 1% NaOCl and 6% EDTA and 17%EDTA; and the length of the canal was recorded radiographically. The canal was then dressed with $Ca(OH)_2$ as an intra-canal medicament, and sealed coronally with GIC (Fuji 7). The patient was recalled after 2 weeks, there was no swelling and the patient was asymptomatic.A final irrigation using 1% NaOCl was done. The apical one-third of the root canal was sealed with 3 to 4 mm of MTA (ProRootMTA, Dentsply). During the 4yr follow-up period, the patient remained asymptomatic. Clinically, the tooth was not tender to percussionor palpation and the findings of the periodontal examination were within normal limits. The radiograph demonstrates evidence of advanced apical bone healing. ***Fig2***

CASE 2:

A 12 yr old boy complained of pain in the upper anterior region. Clinical examination revealed fractured right and left upper central incisors, along with a normal looking mesiodens. A review of history revealed trauma to the upper teeth 4 yrs ago. The colour of both the central incisors was different from the other teeth, both being slightly greyish. Both the central incisors showed no response to vitality testing. IOPA radiograph revealed radiolucent lesion over the apex of the left central incisor,

the tooth having a "funnel shaped" apex. The upper right central incisor showed an Ellis Class 2 fracture. ***Fig3***

Similar uneventful healing was observed as in the above case during the 4year follow-up period ***Fig 4***

CASE 3:

A 25yr old female had come with severe pain and swelling in the upper right lateral incisor. Clinical evaluation revealed a grossly destructed lateral incisor with an abscess in relation to its apex. No mobility was seen. An IOPA radiograph revealed a large radiolucent lesion over the apex of the lateral incisor. ***Fig5*** Also, only about 2mm of tooth structure was left coronal to the CEJ. The central incisor showed a large proximal composite filling and also peri-apical radiolucency. Vitality testing of both the teeth was negative, while that of the adjacent central incisor was within normal limits. The apical one-third of the root canal was sealed with 4 mm of MTA(ProRootMTA, Dentsply). The tooth was then restored by cast metal post and core.

Similar uneventful healing was observed during the 4year follow-up period. ***Fig6***

DISCUSSION:

MTA is hydrophilic cement that sets in the presence of moisture.[14] This are of clinical significance in cases of periradicular inflammation. The presence of exudates, blood, or tissue fluid enhances the setting of MTA and leads to a hermetic seal.[15] This is also a reason that the manufacturer recommends the placement of a moist cotton pellet over the MTA plug.[16] Further the setting expansion of MTA helps in achieving a seal against the canal walls and ensures a proper barrier.[17] It has been established that a good seal from the oral environment is vital to the resolution of periapical infection.[18] MTA, by its virtue of an alkaline pH (12.5) which remains at the same level after setting, is thought to impart an antibacterial effect.[19]

When treating nonvital teeth, a main issue is eliminating bacteria from the root canal system. As instruments cannot be used properly in teeth with open apices;cleaning and disinfection of the root canal system rely on the chemical action of NaOCl as an irrigant and calcium hydroxide as an intracanal dressing.[20]

NaOCl is known to be toxic, especially in high concentrations.

When rinsing immature teeth with open apices, there is an increased risk of pushing the irrigant beyond the apical foramen. Therefore, it is advisable to use less concentrated NaOCl, which is less toxic.[21] In all 3 cases, 1% NaOCl was used.

Calcium hydroxide pastes were used in all cases because of their antimicrobial activity and to prevent MTA extravasation into the periapical area.[22] Different vehicles can be used depending on the length of time the dressing will remain in the canal. When the period was up to 2 weeks, saline was used as the vehicle. Formore extended periods, polyethylene glycol was used as the vehicle because calcium hydroxide ions are released more

slowly and the medication can remain active in the canal for longer periods.[23] A 17% EDTA rinse was carried out before placement of the intracanal dressing to remove the smear layer and facilitate diffusion of calcium hydroxide through the dentin and before obturation to ensure better removal of calcium hydroxide.[24]

MTA has been successfully used as apical plug in the treatment of the teeth with non-vital and open apices.[25] However; there are very few cases and research about the use of MTA in the treatment of the teeth with large periapical lesion. Therefore, we used the MTA for this reason and these cases showed that MTA is a successful material in the long-term in the treatment of the teeth with large periapical lesions when applied in the root canal. MTA has shown to stimulate the formation of new hard tissue at the surface where the MTA material touches.[26] Yildirim et al [27] used MTA in the treatment of the horizontal root fracture as apical plug. After a follow-up that lasted for 5 years, they showed new hard tissue formation around the MTA material radiographically. Therefore, the use of MTA may help to prevent the re-infection in the teeth with large periapical lesions. The thickness of the apical filling was approximately 1 to 5 mm in our teeth. Valois and Costa [28] investigated the influence of the thickness of mineral trioxide aggregate (MTA) on sealing ability of root-end fillings in vitro. They found that a thickness of 4 mm is most adequate for the use of MTA as a root-end filling material compared to 3, 2 and 1 mm. In all cases, 3-4 mm apical filling were done using MTA and the lesions of the teeth were completely healed in 1-4years.

The thickness of MTA material in root canal may be a factor effecting the healing of the large periapical lesion. In our cases, 3 teeth of 3 patients are not enough to assess the effect of thickness on healing of peri-apical lesions. Further research is needed to evaluate the effect of thickness of MTA on healing clinically.

In the present study grey MTA was used in the root canal about as 3-4 mm apical filling and filled remaining canal with gutta-percha and sealer.. Bortoluzzi et al [29] also informed that grey MTA applied in the coronal region of the root canal caused discoloration. Consequently, it seems it may be more appropriate to fill the only apical part of the root canal with MTA. When the MTA is filled as 5 mm apically, if the treatment goes to failure and root-end resection had to be performed after the treatment, no retrograde filling would have to be placed at the time of surgery.

Healing of periapical lesions is a dynamic event and its duration changes from case to case. Long term observation, especially a length of 4years, is an important time for the assessment of the quality and reliability of materials or techniques. There have been studies that have been followed for up to 27 years. However, Ingle [30] based a follow-up period of 2 years for evaluating whether a treatment is successful or not. The follow-up period in the literature for MTA applications were generally applied only one or two

years in different studies.We observed the patients for four years.

CONCLUSIONS:

The use of MTA in the treatment of periapical lesion is not a common method; however, MTA positively affected the healing of the teeth with the lesion after 4 years so it may be concluded that it can be used clinically in the treatment of the teeth with periapical lesion. These results may lead the way for further studies in this field.

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FIGURES:

FIG 1: Depicts a large radiolucent lesion with incomplete root formation in relation to left central incisor.

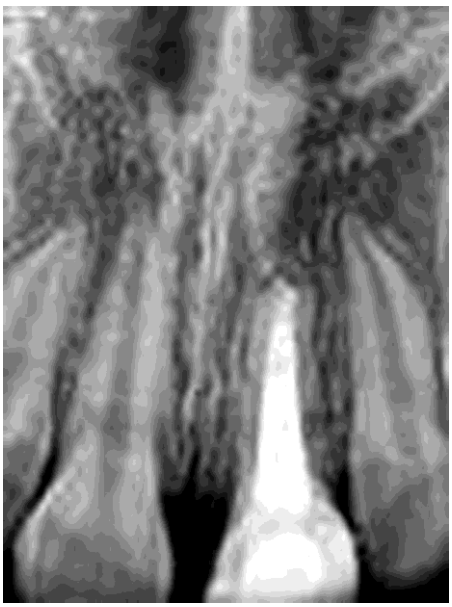

FIG 2: Shows complete apical bone healing.

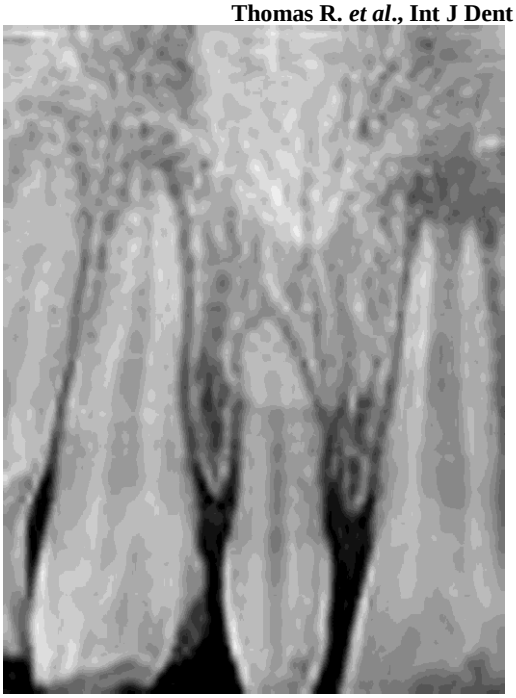

FIG 3: Reveals funnel shaped apex along with radiolucent lesion and Ellis Class II fracture in left central incisor

FIG 4: Evidence of complete apical healing.

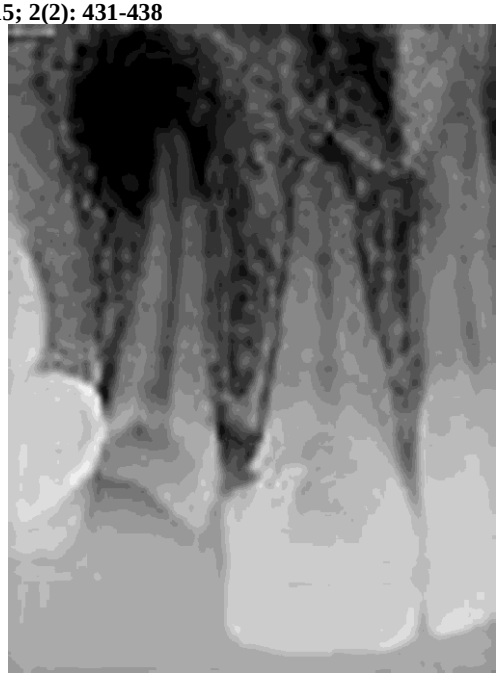

FIG 5: Shows a large radiolucency in relation to right lateral incisor.

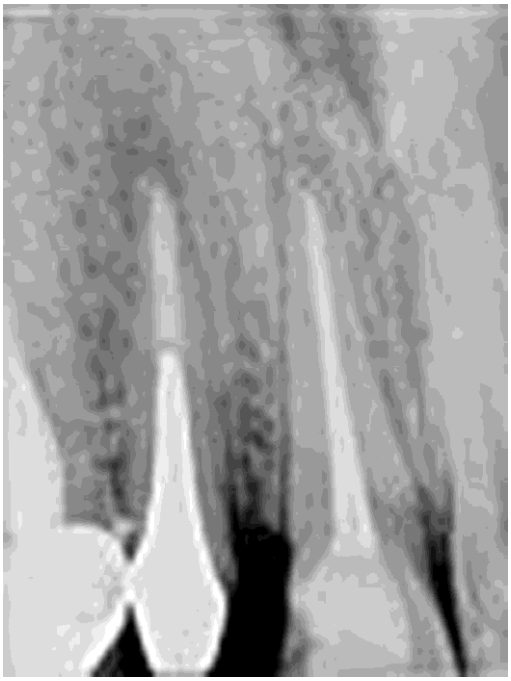

FIG 6: Complete bone healing and restoration of tooth with post and core.