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## Apexification Using MTA Plus as an Apical Plug- 2 Case Reports

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### Case Report

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#### ABSTRACT

Trauma to young permanent tooth with incomplete root suffers pulpal necrosis. Such teeth are managed non surgically, surgically and by apexification. These conditions usually result in difficulty in obturation, fracture of the root and consequently failure of treatment. In such cases, in order to allow the condensation of root filling material and to promote an apical seal, it is imperative to create an artificial apical barrier or induce the closure of apical foramen with calcified tissue by apexification. This paper discusses 2 such traumatic cases which are managed by apexification using a novel material MTA Plus.

### INTRODUCTION

Trauma to young permanent teeth is common and subsequently such incidents leads to pulpal inflammation or necrosis. If trauma occurs before the completion of root formation, the process of root end closure is halted. Retreatment of such teeth is challenging as the apical diameter is often larger than the coronal diameter. Also, open apex and lack of apical stop makes obturation of the canal difficult in all dimensions. The teeth with open apex can be managed by process of apexogenesis if the pulp is vital. If the pulp is necrosed the tooth should undergo apexification.

Apexification according to American Association of Endodontists glossary is defined as "a method of inducing a calcified barrier in a root with open apex or the continued apical development of an incompletely formed root in teeth with necrotic pulp"<sup>[1]</sup>. In past, managing a tooth with open apex in a nonvital tooth was confined to custom filling material, paste fills, and apical surgery<sup>[2]</sup>. The limited success by these procedures led to interest in the phenomenon of continued development of apex and establishing the apical barrier<sup>[3]</sup>.

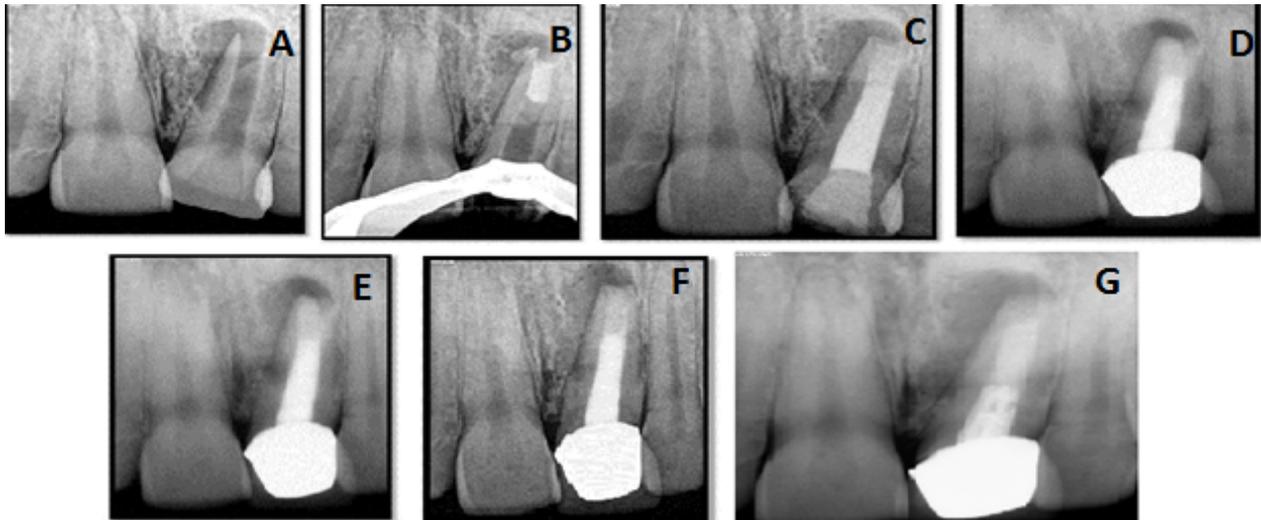
Various materials were used for the induction of apical closure; most accepted being calcium hydroxide which was introduced by Kaiser in 1964 but later was popularized by Frank<sup>[3]</sup>. Later in 1993 Mineral trioxide aggregate (MTA); tricalcium silicate based cement was introduced. This material gained popularity because of its high pH<sup>[4]</sup>.

Recently, a new material MTA Plus is introduced and marketed (compounded by prevest Denpro for Avalon Biomed Inc. USA). Manufacturers claim that this material is similar to MTA and can be used like MTA. The case reports presented uses MTA Plus for the process of apexification.

### CASE REPORT 1

A 25 year old patient reported to department of conservative dentistry and endodontics with pain, broken tooth and discoloration in the upper front tooth region of mouth since six months. Pain was intermittent, dull type and gnawing in nature. Patient gave history of trauma 10 years back. On examination Ellis class II fracture was presented with 21. Tooth was tender on

percussion. Vitality tests revealed (cold test and EPT) no response. A periapical radiograph showed incomplete root end formation (open apex) with a periapical lesion representing a case of acute exacerbation of periapical lesion (**Figure 1A**). The treatment for this case was planned as Apexification using MTA Plus as apical plug and Coronal root canal filling with gutta percha.



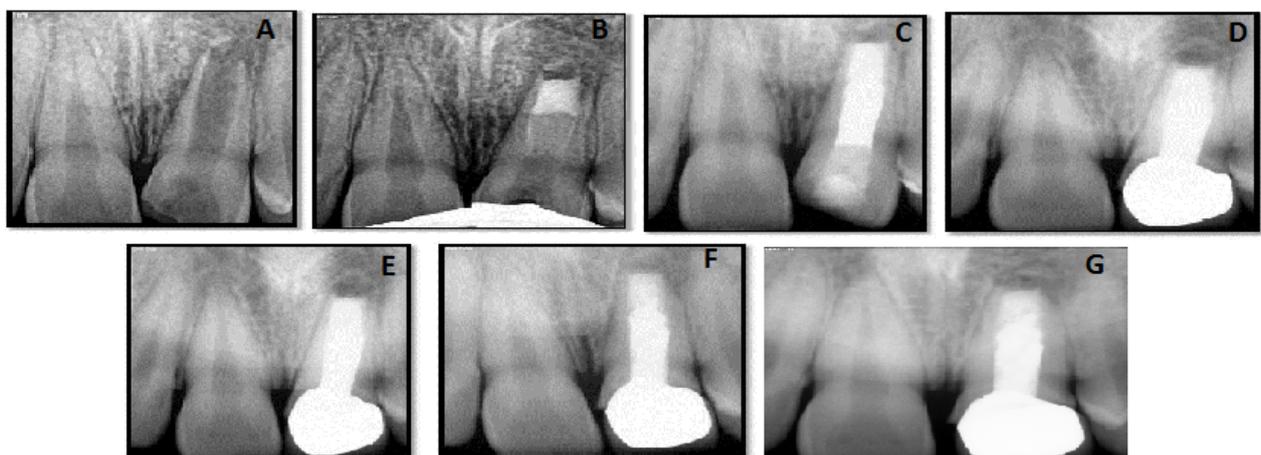
**Figure 1.** A. Pre-operative; B. Apical Plug; C. Obturation; D. 1 Month Follow-up; E. 3 Months follow-up; F. 6 Months follow-up; G. 1 Year follow-up.

The tooth was anesthetised using local anaesthetic solution (2% lidocaine, 1:80,000). Rubber dam isolation was done. Access opening was done, working length was measured 2 mm short of apex. The canal was gently debrided, cleaned and shaped upto 120 no. hand file and copious amount of irrigation was done using 5.25% NaOCl and saline. Access cavity was sealed with Cavit. Patient was dismissed and a course of antibiotics was advised for 5 days. At the second visit tooth was asymptomatic. Apical plug was formed using MTA Plus. It was mixed in the ratio 4:1 (powder: polymer based antiwashout gel) as recommended by manufacturers. Hand pluggers were used to introduce and plug the material to the apex. 3-4 mm thick MTA Plus apical plug was formed and confirmed with a periapical radiograph. Access cavity was sealed with Cavit (**Figure 1B**). At the third visit, apical plug was confirmed with a hand file or pluggers. The remaining length of the canal was obturated upto 2 mm below CEJ using customized GP, Endo floss as sealer. GIC was used to seal the orifice. Coronal post endodontic restoration was done with composite resin (**Figure 1C**). Later tooth preparation was performed and porcelain jacket crown was placed.

Patient was recalled at 1 month (**Figure 1D**), 3 month (**Figure 1E**), 6 month (**Figure 1F**) and 1 year (**Figure 1G**) for evaluation.

## CASE REPORT 2

A 17 year old patient complains of discoloured tooth in the upper front tooth region. Patient had history of traumatic incident 7 years back. On examination discoloration was presented with 11. Tooth was asymptomatic. Vitality test (cold test and EPT) revealed no response. A periapical radiograph reveals open apex with 11 (**Figure 2A**) representing a case of pulpal necrosis. The treatment plan was similar to that of case no. 1. Here the tooth was shaped till no 100 hand file. MTA Plus was mixed and 3-4 mm thick apical plug was placed, (**Figure 2B**). Obturation with customized gutta percha (**Figure 2C**). And access cavity sealed. Later final restoration with all ceramic crown was done.



**Figure 2.** A. Pre-operative; B. Apical Plug; C. Obturation; D. 1 Month Follow-up; E. 3 Months follow-up; F. 6 Months follow-up; G. 1 Year follow-up.

Patient was recalled at 1 month (**Figure 2D**), 3 month (**Figure 2E**), 6 month (**Figure 2F**) and 1 year (**Figure 2G**) for evaluation.

## DISCUSSION

The biological phenomenon of apexification procedure has two views. First view suggests the introduction of chemical activator for induction of hard tissue barrier. Second, denies the use of such activators<sup>[5,6]</sup>. In the present cases mentioned, the activator used for root end formation was MTA Plus. MTA Plus is a tricalcium silicate based cement which has a similar composition as MTA but the powder is ground finer. It is available in dessicant lined container. The powder can be mixed with the water which is provided or anti antiwashout gel.

case report 1, patient reported with pain and radiograph showed periapical radiolucency. After 1 month follow-up (**Figure 1D**) of the patient the periapical radiolucency had not decrease significantly and at 3 month (**Figure 1E**) recall there was definite induction of periapical healing. At 6 months, periapical healing was observed but root end formation was not appreciable (**Figure 1F**). In case report 2, periapical healing was evident in 1st month (**Figure 2D**) and at 3 month follow up (**Figure 2E**) there was evidence of bone induction. At the end of 6 month (**Figure 2F**) complete root end formation was seen.

The barrier formation at apex in apexification procedure varies from case to case as said by various others<sup>[7-10]</sup>. The process of hard tissue barrier formation at apex as described by Ghose et al. is a cap, a bridge or ingrown wedge<sup>[7]</sup>. Cvek reported the presence of infection or periapical radiolucency at the start of treatment increases the time for barrier formation<sup>[10]</sup>. Some other studies say that there is no relation between the pre-treatment infection and periapical radiolucency with barrier tissue formation<sup>[7,9]</sup>. Studies have also shown when symptoms are present then the time for apical closure is increased by 5 months<sup>[10]</sup>. This could be the reason why case reported 1 has extended time for the healing and incomplete root end formation even at 6 months recall. There is continued healing in both the cases (**Figures 1G & 2G**).

These case reports demonstrate the application of MTA Plus for apexification procedure as well as proves the bioactivity of the material by inducing the formation of apical barrier and resolving the periapical infection.

## CONCLUSION

This case report uses MTA Plus as a material for the apexification. The cases presented have shown predictable success rate. However, the material and its effect on the cells needs to be further studied for its greater application.

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