

MANAGEMENT OF FRACTURED IMMATURE TEETH WITH MTA APEXIFICATION AND APPLICATION OF ANATOMIC POST FOR RESTORATION

MANAGEMENT OF FRACTURED IMMATURE TEETH WITH MTA APEXIFICATION AND APPLICATION OF ANATOMIC POST FOR RESTORATION – A CASE REPORT

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INTRODUCTION

Traumatic injuries to the tooth are a challenging public health problem commonly affecting maxillary central incisors. [1,2] The consequence of these injuries such as displacement, fracture, or loss of tooth could alter the physical appearance and speech thus having emotional impacts, affecting one's quality of life.[3,4] Pulpal necrosis may result from these injuries, leading to premature termination of root apex formation in developing teeth.[5]

Apexification is defined as “a method of inducing a calcified barrier in a root with an open apex or the continued apical development of an incompletely formed root in teeth with necrotic pulp”.[6] Mineral trioxide aggregate (MTA) since its introduction has been the material of choice for apexification. Its advantages include apexification in single visit, biocompatible, non-mutagenic, induces formation of hard tissue, and has superior sealing properties.[7]

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Immature traumatized teeth have wider root canals, thin and weak root dentinal walls, hence are more prone for fracture and a prefabricated post (metal or fiber) will fail to replicate root canal anatomy. On the contrary application of custom made anatomic post would prove advantageous as it provides good adaptation, esthetics and retention.[8]

CASE REPORT

A 15 year old male patient presented with fractured and discolored upper maxillary incisors. Patient gave history of trauma 7 years ago following which the tooth was inappropriately treated. On examination, gross destruction and discoloration of both maxillary central incisors were noticed along with a sinus opening on the left incisor [Figure 1a]. Radiographic examination showed improperly treated tooth with periapical lesion and wide open apex [Figure 1b]. Due to esthetic concerns, patient wanted the treatment to be completed in minimal number of visits, so apexification with MTA and fiber anatomic post for aesthetic rehabilitation was planned.

In the first appointment, access was gained into the root canals under rubber dam isolation [Figure 2a] followed by working length determination. Cleaning of the canal

space was done thoroughly using 80 K-file by circumferential filing and copious irrigation with sodium hypochlorite irrigation (3%) and saline. To disinfect the root canal prior to MTA apexification, calcium hydroxide (Metapex; Meta Biomed Ltd, Cheongju city, Chungbuk, Korea) intracanal medicament was placed, followed by a temporary restoration to seal the access. For continuation of treatment, patient was recalled 1 week after the initial appointment.

At the second appointment, the healing of sinus tract was noticed [Figure 2b], and calcium hydroxide was removed, the canal irrigated with 5.25% NaOCl, 17% ethylenediaminetetraacetic acid to remove the smear layer following which paper points were used to dry the canal. White ProRoot MTA (Maillfer, Dentsply, Switzerland) was mixed with distilled water according to the water powder ratio prescribed by the manufacturer. An MTA carrier was used to carry MTA to the apex to obtain a 5mm apical plug [Figure 2c]. After application of MTA, a moist cotton was left within the canal for 24 hours with a temporary coronal seal.

The root canal anatomy of the incisors contraindicated the use of a prefabricated fiber post as it would not provide proper

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adaptation to the post space, and will result in a thick cement layer thus affecting bond strength. Cast gold post and core were also not indicated as the remaining canal dentin thickness will be reduced. In such situation, fabrication of an anatomic post is advised. At the next appointment, post space was prepared using Peeso reamers and any undercut that was present were removed from canal walls. A translucent fiber post (Dentsply, Maillefer, France) was selected for the fabrication of custom anatomic post and was pretreated with 10% hydrofluoric acid for 2 min and then silanized to achieve bonding between composite restorative material and the post. Nano composite material (Filtek™ Z350 XT, 3M ESPE, St Paul, MN, USA) was coated over the post which was then inserted into the canal to adapt precisely replicating the root canal anatomy. Light curing of the post was done 5 seconds intraorally and 20 seconds extraorally after withdrawing the post from the root canal. Finally, anatomical post prepared [Figure 3a] was cemented with dual cure resin cement (Rely-X ARC, 3M ESPE, St. Paul, USA). To confirm the fit of anatomical post and core into the canal, radiographs were taken at different angulations [Figure 3b]. Final prosthetic rehabilitation of the incisors was planned using all ceramic crowns. Crown preparation was carried out at the same appointment, impression made

and teeth were temporized following which all ceramic crowns were cemented. [Figure 3c].

DISCUSSION

MTA demonstrates higher healing rates of 81%-100% than calcium hydroxide[9]. Retrospective study conducted by Witherspoon DE et al on immature teeth with MTA as obturating material, successful outcome was observed in 93.5% of samples.[10] Therefore, MTA has become one of the popular choice for apexification procedures.[11]

Introducing a pre fabricated fiber post in the current case would require thicker layers of luting cement to lute the loosely fitting post, which would result in a adhesive failure of tooth and restoration, ultimately debonding the post.[12] An anatomic post hence would offer superior adaptation, esthetics and retention as it only requires a thin layer of luting cement.[13]

Low modulus of elasticity of anatomic fiber posts used helps to protect the tooth from root fracture as the force transmitted from the post to the tooth are reduced. The wedging effects as seen with cast metal posts resulting in root fracture are less with anatomic posts.[14] The aesthetic anatomic post also forms a monobloc by bonding to the tooth further reinforcing it.

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The preparation of anatomic post does not require intricate laboratory procedures and can be made and luted in a single visit.[13]

Fig 1

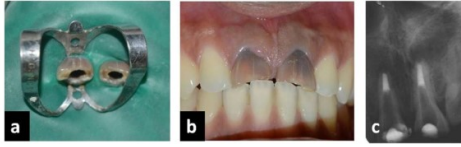


Fig 1a: Clinical pre operative photographs of maxillary incisors, **Fig 1b:** Pre operative diagnostic radiograph

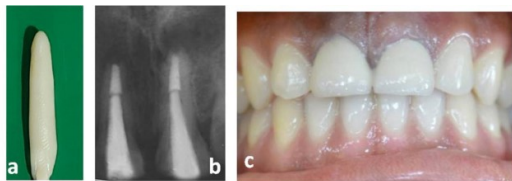


Fig 2

Fig 2a: Access opening under rubber dam, **Fig 2b:** Healed sinus tract, **Fig 2c:** Apexification using MTA (5mm apical plug)



Fig 3

Fig 3a: Custom made anatomic post, **Fig 3b:** Radiograph showing fit of anatomic post, **Fig 3c:** Clinical photograph after crown cementation.

REFERENCES

- 1.A. F. Granville-Garcia, I. T. Vieira, M. J. Siqueira, V. A. de Menezes, and A. L. Cavalcanti, "Traumatic dental injuries and associated factors among Brazilian preschool children aged 1–5 year," *Acta Odontológica Latinoamericana*, vol. 23, no. 1, pp. 47–52, 2010.
- 2.Ravn JJ. Dental injuries in Copenhagen schoolchildren, school years 1967-1972. *Community Dent Oral Epidemiol* 1974;2:231–45.
- 3.M. B. Siqueira, M. C. Gomes, A. C. Oliveira, C. C. Martins, A. F. Granville-Garcia, and S. M. Paiva, "Predisposing factors for traumatic dental injury in primary teeth and seeking of post-trauma care," *Brazilian Dental Journal*, vol. 24, no. 6, pp. 647–654, 2013.
- 4.K. Garg, N. Kalra, R. Tyagi, A. Khatri, and G. Panwar, "An appraisal of the prevalence and attributes of traumatic dental injuries in the permanent anterior teeth among 7–14-year-old schoolchildren of North East Delhi," *Contemporary Clinical Dentistry*, vol. 8, no. 2, pp. 218–224, 2017.
- 5.Wilkinson KL, Beeson TJ, Kirkpatrick TC. Fracture resistance of simulated immature teeth filled with resilon, guttapercha, or composite. *J Endod* 2007;33:480–3.

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6. Anonymous. Glossary of endodontic terms. 7th Edition. Chicago: American Association of Endodontists, 2003.
7. Torabinejad M, Hong CU, McDonald F, Pitt Ford TR. Physical and chemical properties of a new root-end filling material. *J Endod* 1995;21:349-53.
8. Grandini S, Sapio S, Simonetti M. Use of anatomic post and core for reconstructing an endodontically treated tooth: a case report. *J Adhes Dent* 2003;5:243-7.
9. El-Meligy OA, Avery DR. Comparison of apexification with mineral trioxide aggregate and calcium hydroxide. *Pediatr Dent* 2006;28:248-53.
10. Witherspoon DE, Small JC, Regan JD, Nunn M. Retrospective analysis of open apex teeth obturated with mineral trioxide aggregate. *J Endod* 2008;34:1171-6. Epub 2008 Aug 13.
11. Shabahang S, Torabinejad M. Treatment of teeth with open apices using mineral trioxide aggregate. *Pract Periodontics Aesthet Dent* 2000;12:315-20.
12. Ferrari M, Vichy A, Mannocci F, Mason PN. Retrospective study of clinical behavior of several types of fiber post. *Am j Dent* 2000;13:B15-B18.
13. Grandini S, Sapio S, Simonetti M. Use of anatomic post and core for reconstructing an endodontically treated tooth: a case report. *J Adhes Dent* 2003;5:243-7.
14. Stephen Cohen, Kenneth Hargreaves, editors. *Pathways of the pulp*. 9th Edition. Mosby, 2006: 813-6