

Management of an immature apex in a maxillary tooth using a novel apical matrix and MTA plug

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ABSTRACT

Traumatic injury to the tooth especially in the developing stage can lead to incomplete formation of the apex. Treating an immature tooth has its own difficulties like thin apical dentin walls, proper cleaning of the canal and difficulty in obtaining seal at the apex. To overcome the disadvantages of the barrier formed by Calcium hydroxide, MTA was used to form a more predictable apical wall.

To help the MTA form a compact plug at the apex, a matrix is needed. Various materials like Platelet rich fibrin, decalcified freeze dried bone among others have been tried. In this case report, a novel resorbable vicryl suture material with a radio opaque dye has been used as an internal matrix over which an MTA plug has been compacted. The tooth was then obturated by the thermoplasticized method.

INTRODUCTION

Trauma to young permanent teeth results in incomplete formation of the root apex. This may be accompanied by the presence of periapical infection and discoloration of the crown. Endodontic treatment is a challenge in such cases due to the difficulties in cleaning, shaping and obturating with a predictable seal at the apex.¹ The dentin walls at the apex are very thin which may increase the chances of fracture during obturation techniques.² The clinician has to guard against extrusion of the irrigants and the obturating materials being used. Long-term application of calcium hydroxide in water based or oil based form has been used for inducing

apexification in immature permanent teeth with open apices. There are certain disadvantages of this method like weakening of canal dentin, porous calcific barrier formation, absence of lateral dentin thickening, time needed and probable loss of coronal seal leading to contamination and failure.³ Inducing a calcific barrier apically will need repeated changes of calcium hydroxide over 5 to 20 months.^{4,5} To overcome these problems and to offset the possible negative effects presented by prolonged use of intracanal calcium hydroxide medication, placement of apical barriers like freeze-dried bone, tricalcium phosphate, dehydrated dentin matrix, Mineral trioxide aggregate (MTA) and

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Biodentine have been used with varying degrees of success.⁶

In wide open apices, placement of MTA and preventing extrusion of the material is imperative. Using an apical matrix will limit the MTA and help in obtaining a well-compacted apical plug. Various materials have been used for the matrix like hydroxyapatite, resorbable collagen, calcium sulphate, platelet-rich fibrin (PRF), freeze dried bone allograft and tricalcium phosphate.⁷

This case report describes management of a maxillary central incisor with immature apex using MTA as an apical barrier with a novel matrix of resorbable vicryl suture material with radio opaque dye.

CASE REPORT

A 28 year old female reported to the Department with a complaint of intermittent swelling in the maxillary front tooth. She gave a history of trauma to that tooth in childhood. On clinical examination, the maxillary right central incisor [tooth number 11] was fractured at the incisal edge and gave a history of repeated pus discharge from the labial mucosa [Fig 1a]. There was no tenderness to percussion and apical palpation elicited no response. Radiographs showed an immature apex with 11 with a periapical radiolucency [Fig 1b]. 12, 21 and 22 did not show any changes and had intact lamina dura. Endodontic treatment using a barrier for the apical region was planned. Treatment options were explained to the patient and consent was obtained.



Fig 1a: Pre operative clinical view

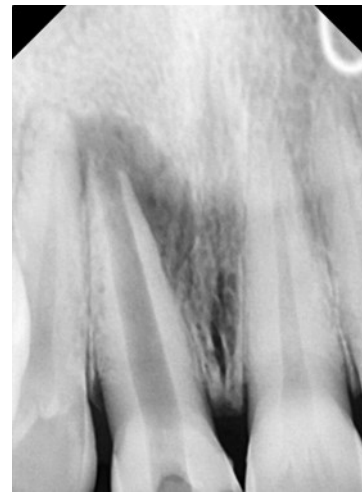


Fig 1b: Pre operative radiograph

Access opening done using round bur (BR 41, Mani, Japan) and Endo safe end bur (ESE 018, SS White, NJ, USA). Apparent working length was estimated with help of periapical radiograph [Fig 2].

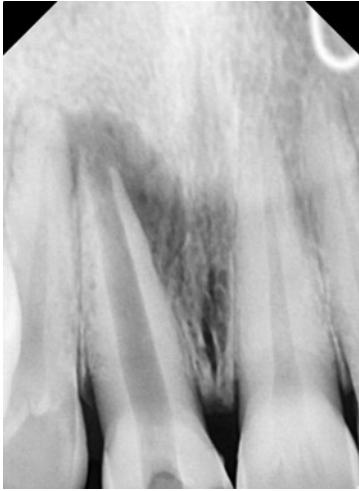


Fig 2: Estimation of working length

Gentle debridement of lateral walls of the canal was done with 80 no K file (Mani, Japan). 3 % sodium hypochlorite (Prime Dental Products, Mumbai, India) was used for irrigation and care was taken so that extrusion was avoided periapically. This was done by the use of 30 gauge side vented irrigation needles (Transcodent GmbH, Germany). 2% CHX (Dentochlor, Ammdent Dental, Chandigarh, India) was used as a final irrigant.

A water based calcium hydroxide dressing (RC Cal, Prime Dental Products, Mumbai, India) was placed in canal for 10 days [Fig 3]. In the second appointment, the tooth was asymptomatic and there was no drainage from the canal. The calcium hydroxide dressing was repeated and patient was recalled after 10 days. At the third appointment, the tooth was ready for obturation.

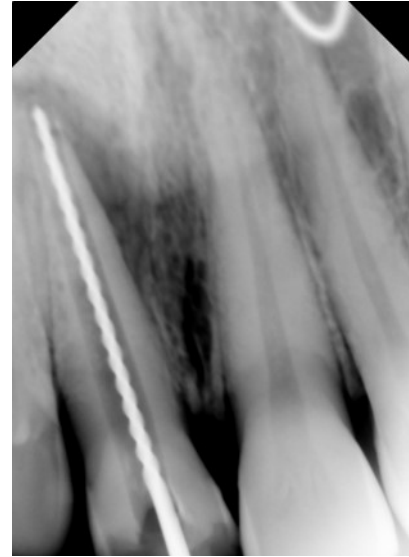


Fig 3: Intra canal medicament of Calcium hydroxide

A hand plugger (Buchanan hand plugger, Kerr, CA, USA) was selected which fits 2 mm short of estimated working length. Sterilized resorbable vicryl suture material (Ethicon, 3-0, Johnson & Johnson, Aurangabad, India) is taken. Multiple non identical sliding knots were prepared with the help of needle holder. The entire material was dipped in a radiographic detectable dye (Urografin 76%, Zydus Cadila, Ahmedabad, India). The material is held with tweezers and placed in canal. It is pushed till the estimated apex with help of selected plugger and confirmed by radiograph.

MTA (MTA white, Angelus, Brazil) was mixed according to the manufacturers recommended proportion. It is placed in the canal with the help of a 1.2mm MTA carrier (GDC, Punjab, India) and gently pushed up to the vicryl knot matrix so that a thickness of 3mm is achieved. Radiographs were taken to confirm the position [Fig 4a]. A moist cotton pellet is placed over the MTA plug and the tooth was temporized. The patient was recalled after 2 days. The set of the MTA plug was confirmed and obturation was done by thermoplastic method (E & Q, Meta Biomed, South Korea) [Fig 4b].

Post obturation restoration was done using composite resin material (Tetric Ceram, Ivoclar Vivadent, Germany) [Fig 4c].

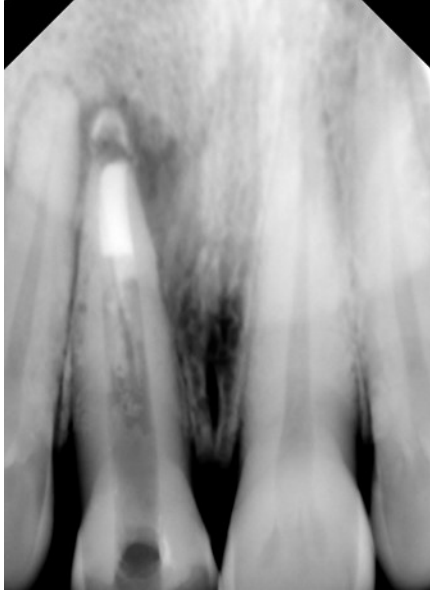


Fig 4a: Resorbable vicryl suture and MTA plug

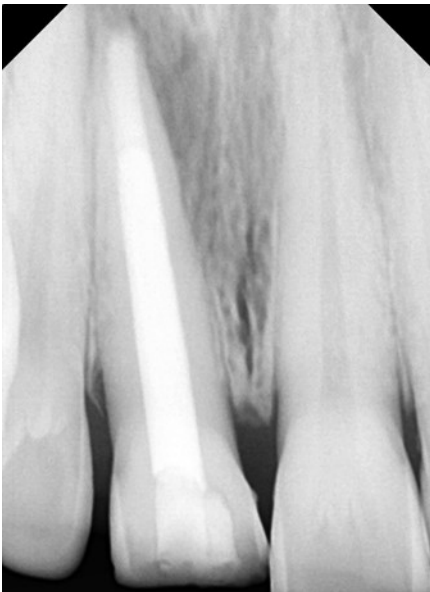


Fig 4b: Post obturation radiograph



Fig 4c: Post obturation build up - Composite resin restoration

DISCUSSION

The factors needed for the success in challenging cases like immature teeth with open apices are thorough debridement and disinfection of the canal space. This can be achieved by the use of tissue dissolving irrigants like 3% Sodium Hypochlorite. Disinfection can be carried out by the use of calcium hydroxide in water or oil based form.⁸ Here, the water based form was used as dissociation into Calcium and Hydroxyl ions is faster. As they need to be frequently replaced, the medicament was placed for 2 visits till the canal space was completely disinfected.

In this case, placement of an apical barrier allowed for completion of the treatment in a lesser number of visits, hence avoiding the risk of contamination or root fracture. The barrier material needs to have excellent biological properties and be dimensionally stable.⁶ For the material to be held in place and prevent extrusion into periapical space, a matrix is necessary. Materials which have been used for this purpose include Platelet rich fibrin, freeze dried bone allograft and resorbable collagen.⁶ In this case, a novel apical matrix using resorbable vicryl suture material was employed. The non identical sliding knots placed in the material helped to give it stability and

ensured a firm barrier against which the MTA could be packed.⁹

The difficulty in using the matrix is precise placement at the apical area. To overcome this problem, the suture material was dipped in a radio-opaque contrast medium, Urografin 76%. It contains sodium diatrizoate-meglumindiatrizoate.¹⁰ It is commonly employed diagnostically in angiography, urography, CT etc. The contrast medium helped to visualize the knotted suture material in the radiographs and helped in accurate placement at the estimated apical area.

MTA was initially introduced as a retrograde filling material by Torabinejad.⁸ It has since expanded its applications and is used as a perforation repair material, obturating material, sealer etc. It has certain desirable properties like biocompatibility, osteogenic activity, fibroblast stimulation, bone tissue tolerance and antimicrobial activity. Coupled with its sealing capacity and ability to set in moist environment, it is preferred for use in endodontics. Its sealing capability is due to the interaction of Calcium and Hydroxyl ions released while setting. This interacts with the phosphate containing body fluids resulting in the formation of apatite like interfacial deposits. The shrinkage of MTA during setting is offset by these deposits. They have the added advantage in that they improve the frictional resistance of the material to the canal walls.¹¹

MTA was allowed to set for 2 days thereby helping in the hydration process and its setting reaction. It also allowed minimal interference in the healing process.⁶ The knotted vicryl suture material helped in the packing of a dense 3mm plug. It has been shown that this will have a significant impact on displacement resistance of the material from the canal walls.¹² After the setting of MTA, the obturation of the canal space was completed using the thermoplasticized method. Regular follow up

of the patient has shown tooth to be completely asymptomatic and functional.

CONCLUSION

The difficulties in managing a case of immature tooth with open apex can be overcome with the help of an apical matrix and barrier. This case describes the use of a novel resorbable vicryl suture material as an apical matrix in combination with an apical barrier of MTA. It allows for predictable placement of the material at the apex so that a well compacted canal obturation can be completed.

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