Brief Communication

Treatment of open apices using two different methods – A report of two cases

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Conventional endodontic treatment is not possible for the management of an immature tooth with an open apex. Hence, the dentist has to rely on materials such as calcium hydroxide and mineral trioxide aggregate (MTA) for the management of such cases where apical formation is desired. This paper reports of two cases where successful healing and apexification were performed using calcium hydroxide and MTA

KEY WORDS: Apexification, apical plug, calcium hydroxide, cavity, mineral trioxide aggregate, sodium hypochlorite, thermoplastic

INTRODUCTION

A successful endodontic treatment warrants complete asepsis and three-dimensional obturation of the root canal. However, in cases of teeth with an immature apex, absence of natural apical constriction creates a challenge in disinfection and harmonious sealing of the canal. Therefore, in such cases, it is essential for creating an apical barrier against which one can place root canal filling material.

Apexification refers to management of the pulpless permanent tooth with an open apex using endodontic treatment to form a hard tissue barrier.[1] It is a procedure aimed at inducing apical repair. Apexification involves debridement of the canal followed by placement of a medicament to stimulate apical healing and formation of an apical barrier.

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The composition of the apical barrier seems to vary. Natural materials such as bone cementum or dentin can act as an apical bridge.[2-4] Studies have concluded that the combination of all three tissues in conjugation with calcium hydroxide is known to give the best results.[5-7]

Over the years, the material scientists have tried several materials to form apical barrier. Artificial medicaments calcium hydroxide powder alone or in conjugation with different vehicles such as saline, local anesthetic solution, chlorhexidine, and distilled water and natural substances such as collagen, osteogenic protein, bone growth factor, and oxidized cellulose have been used to create an apical plug. However, the search of an ideal root end filling material

culminated with the introduction of mineral trioxide aggregate (MTA).[8]

This paper reports of two cases where calcium hydroxide and MTA were used in the apexification procedure.

CASE REPORT 1: APEXIFICATION USING CALCIUM HYDROXIDE

A 20-year-old female patient reported with a chief complaint of discolored right upper front tooth. Detailed history revealed a traumatic injury 10 years back. Clinical examination revealed discolored maxillary central incisor while radiographic examination revealed tooth 11 with an open apex [Figure 1]. To manage this case, calcium hydroxide apexification was planned.

Access cavity was prepared irt 11 to remove the pulpal remnants. The root canal was cleaned and shaped using endodontic instruments and irrigant. Calcium hydroxide paste [Figure 2] was then placed in the root canal system for 6 months to achieve apical closure [Figure 3]. Follow-up radiograph revealed apical closure irt 11 [Figure 4]. Remaining canal was obturated using thermoplastic technique [Figure 5].

Figure 1: Pre-operative IOPAR

Figure 2: CAOH dressing placed

CASE REPORT 2: APEXIFICATION USING MTA

A 26-year-old female patient reported to the OPD with a chief complaint of discolored upper front tooth. Clinical examination revealed discolored left maxillary central incisor. Radiographic examination revealed an Ellis Class III Fracture irt tooth 21 with an open apex and tooth 11 presented with internal resorption [Figure 6]. Single visit apexification using MTA was planned for the left maxillary central incisor (tooth 21) whereas MTA obturation was planned for the right maxillary central incisor (tooth 11).

After rubber dam isolation, access cavity preparation was done irt 21 and 11 [Figure 7]. Pulp was extirpated and calcium hydroxide was placed in the root canal for 1 week. After 1 week, calcium hydroxide paste was removed from and MTA mixed with sterile water was placed in the canal and condensed to apical end of the root to create a 5 mm of apical plug [Figure 8]. Remaining canal was obturated using thermoplastic technique [Figure 9]. The right maxillary central incisor (tooth 11) was obturated using MTA [Figure 10].

Figure 3: Six-month follow-up showing closed apex

Figure 4: Apical closure

Figure 5: Post-obturation IOPAR

Figure 6: Pre-operative IOPAR

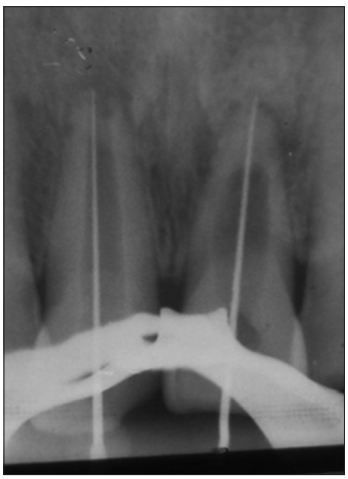

Figure 7: Working length IOPAR

Figure 8: Apical plug of MTA

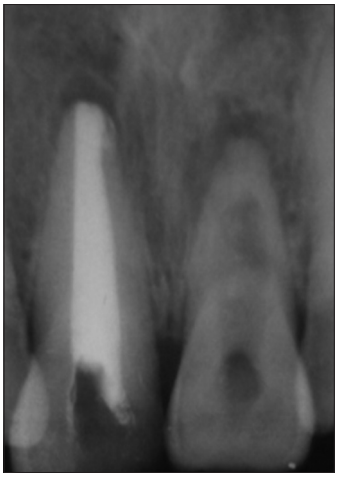

Figure 9: Post-obturation IOPAR

Figure 10: Post-procedure IOPAR

DISCUSSION

Apexification is performed to obtain an apical barrier which would inhibit the passage of toxins and bacteria into periapical tissues from root canal resulting in a sterile root canal. Moreover, this barrier ensures compaction of root filling material, thereby providing a three-dimensional obturation.[9,10]

The use of $Ca(OH)_2$ in apical barrier formation has shown promising results due to its enhanced success rate, ease of availability for clinician and affordability for patients, its alkaline nature that results in mineralization, and its antibacterial properties.[11] Chawla *et al*.[12] suggested that $Ca(OH)_2$ was sufficient to initiate dentinal bridge formation while Chosack *et al*.[13] in their study inferred that $Ca(OH)_2$ provides excellent

healing. The biggest disadvantage of $Ca(OH)_2$ apexification is the long treatment time associated with it.[14,15]

MTA is a biocompatible biomaterial with numerous clinical applications in the field of endodontics.[16] It is superior to other materials due to its osteogenic, dentinogenic, and cementogenic potential.[17] MTA apexification represents a primary monoblock where appetite like interfacial deposits fill the gap induced during material shrinkage thereby ensuring an optimum seal of MTA.[18] Due to its alkaline pH, MTA is biocompatible and less cytotoxic which provides a favorable environment for cementum deposition.[19,20] It is advised to have a 5 mm apical seal of MTA as it is stronger and shows less leakage.[21]

Apexification using MTA is a single visit procedure and there is less chance of root fracture in immature teeth with thin roots as the material immediately bonds with the roots and strengthens it.

CONCLUSION

The superior physical properties, sealing ability, biocompatibility, and clinical performance of MTA make it an ideal substitute for calcium hydroxide in apexification procedure. However, the cost factor and less technique sensitivity of calcium hydroxide make it an ideal material in pediatric dentistry. Single visit apexification with a MTA is a boon in effective management of teeth with open apex as this procedure is predictable and less time consuming.

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