

Management of teeth with revascularization failure by two visit Mineral Trioxide Aggregate Apexification – A case report

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Citation of this Article: Dr. Arpitha CM, Dr. Keerthana G, “Management of teeth with revascularization failure by two visit Mineral Trioxide Aggregate Apexification – A case report”, IJDSIR- August - 2021, Vol. – 4, Issue - 4, P. No. 49 – 54.

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Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

Treatment of necrotic immature teeth has always been a challenge for the clinician due to the wide open apex and weak root structure, which does not facilitate conventional endodontic treatment. Although several therapeutic options are available, MTA apexification and revascularization are the popular treatment modalities to treat such cases. As revitalization therapy occasionally might result in failure, apexification procedure seems to be promising for a desirable outcome in the unsuccessful revitalization cases. This case report highlights one such case which is managed non-surgically.

Keywords: Immature permanent teeth, open apex, apexification, apical barrier, MTA, revitalization/revascularization/ regenerative endodontic procedure, outcome.

Introduction

The management of immature permanent teeth with pulpal necrosis is challenging as the root canal system is often difficult to debride and the thin dentinal walls are at an

increased risk of a subsequent cervical fracture [1]. Popular treatment modality is the conventional Ca(OH)₂ / MTA apexification and recently revitalization seems to be promising. Revitalization, is a biologically based treatment aims at the regeneration of the dentine–pulp complex [2]. It has played an important role in the treatment of immature permanent teeth with necrotic pulp tissue and/or apical periodontitis/abscesses since they were first introduced into clinical practice [3]. Outcomes of regenerative procedure is unpredictable. Chen et al [4] described five types of responses of immature permanent teeth following revitalization when assessed radiographically: type 1, increased thickening of the canal walls and continued root maturation; type 2, no significant continuation of root development and the root apex became blunt and closed; type 3, continued root development and the apical foramen remained open; type 4, severe calcification (obliteration) of the canal space; type 5, a hard tissue barrier formed in the canal space

between the coronal mineral trioxide aggregate (MTA) plug and the root apex.

In contrast, the apexification procedure, a popular technique to manage necrotic immature permanent teeth, induces a calcified barrier at the immature apex. This procedure comprises removal of the necrotic tissue followed by debridement and proper disinfection of the root canal system to control the infection. Calcium hydroxide [Ca(OH)₂] is the most commonly used material in apexification to develop the apical barrier due to biological and healing performances. However, due to several disadvantages, apical plug of MTA has been reported as an alternative to long-term Ca(OH)₂ application which presents shorter treatment time and higher predictability for apical closure [6].

Occasionally, regenerative endodontic procedures might fail. Once they fail, alternative treatment modalities still remain which include either apexification or a second attempt of revitalization. MTA apexification and revascularization provide reliable outcomes in the aspects of resolution of the disease and tooth functional retention. Several studies [6&7] have compared the effectiveness between apexification and revascularization in terms of success and further root development. The evaluation of treated teeth was based on clinical and radiographic examination. Both procedures provided satisfactory successful outcomes, with success rates ranging from 76%–100% [8-18].

This article reports a case of failed regenerative endodontic procedure with consistent apical periodontitis which was managed by the barrier technique using MTA.

Case report

A 17-year old male patient reported to the department of conservative dentistry and endodontics with pain in respect to his lower anterior tooth region and dental history revealed that the tooth #41 had dental treatment 3

years earlier and his medical history was non-contributory. Upon intraoral clinical examination, the tooth # 41 was discolored and well-defined swelling on labial aspect of the same tooth with purulent discharge was noted (Fig. A). Both electric and thermal pulp tests were negative for tooth # 41. Radiographic examination revealed the presence of periapical lesion with immature root apex. An attempted regenerative procedure was notable from the radiograph (Fig. B) and the outcomes of the procedure were unsuccessful and considered as failure. The decision to renegotiate the wide canal was made.

Various alternative treatment options to treat the tooth was explained to the patient, upon giving consent for apexification procedure we proceeded with the 2 visit apexification procedure as it was thought to be the best procedure for the present case.

Procedure

After local infiltration, the tooth was isolated with rubber dam and previous coronal restoration was removed. The MTA/Ca(OH)₂ was removed using ultrasonic tip with continuous sterile saline irrigation. The purulent discharge was observed from the canal, the wide canal was irrigated with positive syringe pressure using 5.25% NaOCl and dressed with Ca(OH)₂ for 2 weeks and temporized using cavitemp. 2 weeks later, the swelling and the sinus tract was resolved. The wide canal was re-accessed, working length determined (Fig. C) filing was done with #60 H file with light pressure strokes to clean the debris with copious irrigation (5.25% NaOCl) throughout the procedure and followed by final rinse with 17%EDTA. The canals were dried using paper points, collagen apical plug was placed as an apical stop and 4 -5 mm apical MTA plug was placed using straight messing root canal gun. The rest of the canal was obturated using thermo-plasticized gutta-percha and ZOE sealer (Fig. D). The tooth was restored with composite resin (Fig. E). The 2-year follow-up

evaluation revealed an asymptomatic tooth with healthy soft tissues and slight discoloration (Fig. F).. The radiographic examination revealed uneventful healing of the periapical lesion (Fig. G).

Discussion

This report presented a case of regenerative endodontic procedure failure and its management. The expected reason for failure would be the intracanal microorganisms that remained in the root canal space. Intracanal biofilms could remain in root canal systems after instrumentation-free root canal disinfection during regenerative endodontic procedures. Histo-bacteriologic observations of a failed revascularization therapy claimed that the lack of mechanical debridement was the main reason for the bacterial colonization and the main reason for treatment failure[19]. Nagy et al. [20] reported that 3 teeth exhibited clinical and radiographic fail signs during examination while being treated with apexification. Alobaid et al. [7] described 4 failures in the revascularization group, of which one tooth failed due to trauma, needing to be extracted because of a complicated fracture. The other failures were due to persistent infection of root canal systems, requiring a new endodontic reintervention.

Whenever regenerative endodontic procedures fail, alternative treatment options should be always considered. In general, regenerative procedure is the most conservative approaches to treat the necrotic pulp of the immature teeth. This is because they always provide us more alternatives to choose from, like apexification/MTA plug placement and second attempt of revascularization. Clinical evaluation and radiographic evaluation of the root and the root canal space such as condition and color of the crown, pulp space dimensions, thickness and length of root walls, size of apical foramina determine further treatment modalities.

In this case apexification procedure was the alternative treatment modality chosen to treat the previous unsuccessful revitalization therapy which showed favourable results. Removal of the coronal MTA plug and placement of an apical MTA plug after enhanced disinfection was preferred over long term $\text{Ca}(\text{OH})_2$ apexification procedures. This technique is aimed at forming an apical barrier which allowed the compaction of filling materials and prevent the entry of bacteria into periapical tissues [11]. As opposed to long-term $\text{Ca}(\text{OH})_2$ -based apexification procedures, apical plug techniques with the use of artificial biocompatible barriers are completed in 1 or 2 visits, thus reducing the risk of tooth fracture, the risk of coronal microleakage, and the risk of decrease in the fracture resistance of the root [21&22]. Previous clinical studies, case series, and case reports have been reported with satisfactory clinical and radiographic outcomes for the MTA apical plug technique [9-11,23]

Conclusion

Although high success rate achievable with regenerative endodontic procedure, clinicians should be aware of unpredictable outcome and long-term failure of revascularized teeth. An alternative treatment options remain. If in case apical opening remains unaltered available treatment options to choose from include apexification techniques, apical biocompatible barrier techniques, or repetition of the regenerative endodontic procedures. In case of revascularization /apexification, infection control seems to be the important factor that has to be accounted for the successful outcome.

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Legend Figures



Fig. A & B: Preoperative Photograph With Swelling On Labial Aspect Of 41 And Dicoloured Tooth

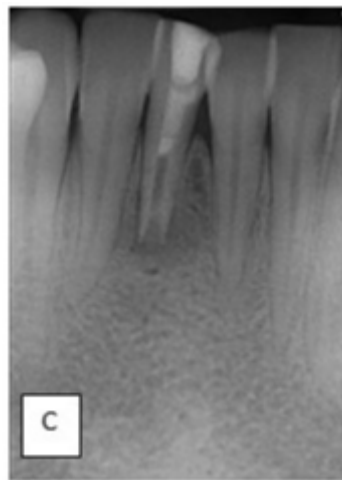


Fig. C: Preoperative Radiograph Showing Failed Revascularization Procedure

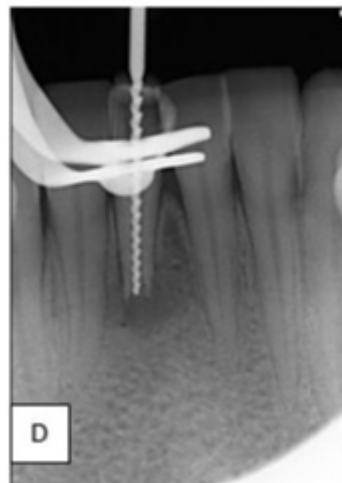


Fig. D: Working Length Determination Radiograph

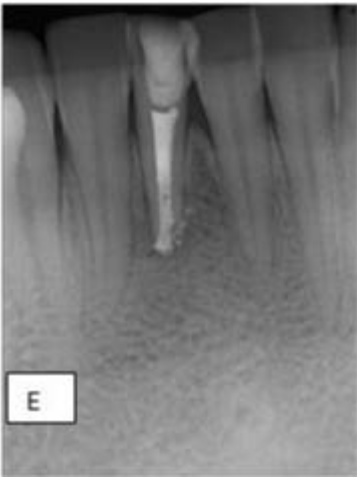


Fig. E: Immediate Post Operative Radiograph



Fig. F: Photograph Showing Resolved Swelling And Healed Soft Tissues

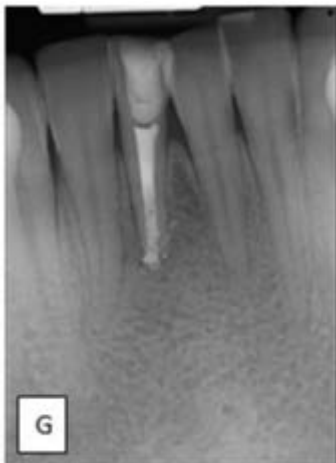


Fig. G: 2 Year Radiograph Showing Healed Periapical Lesion.