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Case Report

Aesthetic management of a discoloured non-vital immature maxillary central incisor

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their appearance and function. In particular, a single anterior discoloured tooth often presents as an aesthetic challenge as it is seldom satisfactorily managed by direct and indirect restorative modalities. Moreover, in children and adolescents, migration of the gingival margin can lead to deterioration in esthetics if definitive restorations are planned.³

The subjected case report presents the management of a trauma induced intrinsically discoloured non-vital open apex tooth by “walking bleach” technique along with the use of mineral trioxide aggregate (MTA) as a bleaching barrier material and as an apical plug.

Case report

A 15-year old patient presented with the chief complaint of a discoloured right upper front tooth for past 4 years. The patient sustained trauma of the tooth following a bicycle accident. On clinical examination, the maxillary right central incisor (11) was discoloured with physiologic mobility; it was however asymptomatic (Fig. 1A). Radiographic examination revealed a blunderbuss root canal (Fig. 1B). Pulp vitality tests were suggestive of non-vitality.

The case was diagnosed as a non-vital maxillary right central incisor with blunder buss canal. One step apexification

Introduction

Intrinsic discolouration of the tooth following pulpal necrosis occurs due to the penetration of the hemolysed products of the erythrocytes into the dentinal tubules.¹ Moreover, pulpal necrosis occurring during early stages of apexogenesis may result in formation of a blunderbuss root canal.²

Cases of trauma induced intrinsically discoloured non-vital tooth with open apex requires comprehensive endodontic, restorative and aesthetic management to restore

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using MTA followed by “walking bleach” technique for aesthetic management was proposed and informed consent of the parents was taken.

Access cavity of 11 was prepared under rubber dam and the working length determined. The root canal was instrumented using K-file of size no.60 and copious irrigation of 0.5% sodium hypochlorite was done. In order to disinfect the root canal system calcium hydroxide (Metapex, Meta Biomed Co., Ltd.) was placed as an intra-canal medicament and the tooth was coronally sealed with temporary restoration. After a time span of one month, the canal was reentered and irrigated to remove calcium hydroxide.

White MTA (ProRoot, Dentsply) was mixed according to manufacturer's instruction and delivered at the apical portion of the canal using MTA Gun System (Dentsply Maillefer, Switzerland) in order to achieve a periapical plug of about 4 mm thickness. Condensation of MTA at the apex was carried out using an appropriate sized endodontic plugger (Schilder's plugger) and a subsequent intraoperative radiograph was taken to confirm its apical position (Fig. 1C). A moist cotton pellet was

placed inside the canal over the MTA plug to favour hydration process. Next day the patient was recalled and the hard set of the MTA was verified using an endodontic file. The canal was obturated with gutta percha (GP) cones (Dentsply Maillefer, Switzerland) using lateral condensation technique. Thereafter, a No.3 Gates Glidden drill (Mani Inc, Tochigi, Japan) was used to remove GP up to the level of cemento-enamel junction (Fig. 1D).

White MTA was placed as a bleaching barrier for about 2 mm thickness. The patient was recalled next day and the access cavity was etched with 37% orthophosphoric acid in order to provide an adhesive temporary restoration before application of the bleaching agent. A mixture of 30% hydrogen peroxide and sodium perborate (Degussa, Hanau, Germany) in the ratio (0.5 ml of liquid to 1 gm of powder), was made and placed in the pulp chamber over the MTA barrier using amalgam carrier. The dentin bonding agent was impregnated in a cotton pellet and was placed over the bleaching mixture and then light-cured. Resin composite material (Filtek Z350, 3MESPE, MN, USA) was placed as adhesive temporary filling material.

Fig. 1 – A: A single discoloured 11, B: blunder buss root canal, C: one step apexification using MTA, D: GP retrieved upto the level of CEJ.

The patient was recalled after every 10 days for review and the bleaching procedure was repeated till the desired shade of the adjacent left central incisor was obtained (Fig. 2A). Radiographs were taken in follow-up visits to rule out resorption episode. After obtaining the desired shade, the bleaching mixture was removed. A small cotton pellet soaked with enzyme catalase (FGM Dental products, Brazil) was placed in the pulp chamber for 3 min and then the pulp chamber was flushed with water. The access cavity was then subsequently restored with resin composite material (Filtek Z350, 3MESPE, MN, USA).

A 24 month follow-up showed no re-discolouration and the bleached shade was maintained (Fig. 2B). Follow-up radiograph showed no evidence of cervical resorption (Fig. 2C).

Discussion

The early concept of per-borate technique was modified by Nutting and Poe in 1963 as “walking bleach” technique by adding 30% of hydrogen peroxide to the bleaching mixture in order to increase the bleaching effectiveness.^{3,4} Intra coronal bleaching is a valuable treatment modality yet not devoid of relative risk factors like external cervical resorption (ECR) and re-discolouration.

Plotino⁴ advocated the use of adhesive temporary filling in order to prevent leakage of the bleaching agent. Moreover, the risk of renewed staining and dentinal recontamination during inter appointments is avoided when an adhesive temporary restoration is used.

Initiation of local inflammatory reaction subsequent to the penetration of hydrogen peroxide through the patent dentinal

tubules to the cervical periodontal ligament causes ECR. Long-term clinical follow-up studies had shown that the occurrences of this resorptive episode were prevented following placement of barrier material that occludes the passage of hydrogen peroxide to the periodontium.^{1,5}

In the presented case report, MTA was used as barrier material instead of commonly used materials like Cavit, Modified Zinc Oxide Eugenol (IRM), Glass Ionomer Cement (GIC) and Resin Modified GIC. The excellent physiochemical property of MTA might have an advantage when used as barrier material. During the hydration process of MTA, calcium ions are released. With time, as the material sets, the concentration of calcium ions increases resulting in a mineralized dentin-MTA interstitial layer⁶ which could have occluded the passage of hydrogen peroxide to the periodontium. An in-vitro study by Vosoughhosseini et al⁷ showed white MTA had superior sealing property when used as a barrier material compared to GIC.

In the present case, enzyme catalase was used to remove residual oxidants and to facilitate immediate permanent adhesive composite restoration. Catalase, also referred to as H₂O₂ oxidoreductase, acts on hydrogen peroxide and convert it into water and oxygen.^{3,8} Ganesh et al⁹ compared the intra-coronal bleaching efficiency of 10% hydrogen peroxide against 10% carbamide peroxide in an in-vitro study and concluded that hydrogen peroxide group showed superior results.

Various treatment modalities are currently available to activate the bleaching agent to accelerate the production of free radicals. Contemporary Laser assisted activation technique have produced successful outcome. An in-vitro Laser (Er, Cr: YSGG) assisted intracoronary bleaching by Mohammadi et al¹⁰ showed results which were comparable to conventional technique.

Fig. 2 – A: Interappointment review photograph, B: 24 month followup photograph showing stability of the bleached shade, C: 24 month followup radiograph showing absence of ECR of bleached tooth.

Conclusion

“Walking bleach” is a valuable treatment option for a single discoloured tooth if procedural protocol and precautions are strictly adhered when compared against direct and indirect restorative modalities.

Conflicts of interest

All authors have none to declare.

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