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Original Research Paper

Dentistry

MANAGEMENT OF OPEN APEX USING BIODENTINE BIOROOT INLAY: A CASE REPORT

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ABSTRACT Achieving an appropriate apical barrier is critical for the successful treatment of immature teeth with open apices. Biodentine, a calcium silicate–based bioactive cement, possesses superior biological and physical properties. While its orthograde placement is technique-sensitive and retrograde placement requires surgery, an alternative approach is the use of a prefabricated BioRoot inlay. This case report presents the management of a permanent maxillary central incisor with a wide-open apex and parallel dentinal walls using Biodentine BioRoot inlay. The inlay was fabricated as a custom-fit, intraradicular prefabricated restoration and placed passively with Biodentine sealer to achieve a three-dimensional seal and stimulate apical barrier formation. Biodentine BioRoot inlay demonstrated effective sealing ability, promoted periapical healing, and provided an innovative solution for obturating wide-open apices.

KEYWORDS :

INTRODUCTION

Root formation is usually completed within 3 years of tooth eruption, during which time the apex undergoes morphological and anatomical maturation. Trauma, caries, or periapical infection during this period can interrupt root development, resulting in immature teeth with wide-open apices. These cases present challenges in establishing an apical barrier between the canal system and periapical tissues. Traditionally, management has relied on calcium hydroxide or mineral trioxide aggregate (MTA), while surgical approaches such as apicoectomy have also been used.

Biodentine, a tricalcium silicate–based material, is bioactive and biocompatible, inducing tertiary dentin formation and providing a reliable apical seal. Its adhesion to dentin has been reported to surpass that of MTA and calcium hydroxide. However, orthograde placement is technique-sensitive, requiring multiple radiographs, and retrograde placement necessitates surgery. To address these limitations, the BioRoot inlay technique was developed, wherein a prefabricated Biodentine plug is customized to the root canal shape. This method ensures a three-dimensional seal and promotes barrier formation in open apices.

This case report demonstrates the use of a Biodentine BioRoot inlay for the closure of an open apex in a permanent central incisor.

Case Report

A 23-year-old female presented with discoloration of the upper front tooth for one month. The patient reported trauma to the anterior teeth 8 years earlier. Clinical examination revealed discoloration of the right maxillary central incisor, which was non-responsive to vitality testing. Radiographic evaluation confirmed a wide-open apex with thin dentinal walls.

Following anesthesia and rubber dam isolation, access opening was performed, and working length was established radiographically. Minimal circumferential filing was carried out and 3% sodium hypochlorite (NaOCl) irrigation was done. Calcium hydroxide paste was placed as an intracanal medicament, and the access cavity was temporarily restored.

At a one-month recall, the patient was asymptomatic. After removal of the medicament with 3% NaOCl and 17% EDTA irrigation, a light-body elastomeric impression of the canal was taken using a master file as a carrier. This impression was embedded in putty material to serve as a mould.

Biodentine was mixed as per manufacturer instructions and incrementally placed into the mold to fabricate a plug corresponding to the canal shape. After setting for 15 minutes, the mold was sectioned, and the Biodentine BioRoot inlay was retrieved. The inlay was passively inserted into the canal using Biodentine sealer to ensure complete adaptation, achieving a monoblock effect.

The patient was followed up clinically and radiographically. At 6 months, radiographs showed resolution of the periapical lesion with bone healing. At 12 months, continued periapical repair and functional tooth stability were observed.

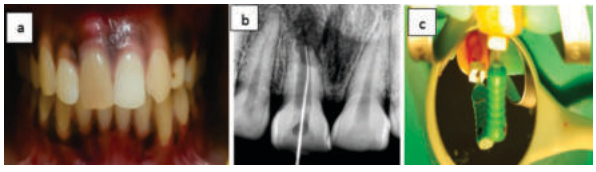

Fig 1 a) Preoperative intraoral picture of the patient, b) working length determination of tooth And c) light body material used to make impression of the canal

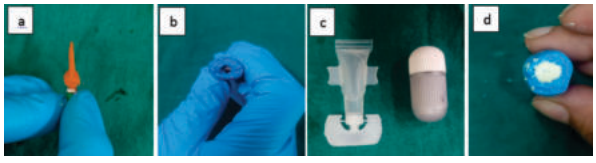

Fig 2 a) light body impression of the canal b) mould prepared with putty c) biodentine powder and liquid and d) mould filled with biodentine

Fig 3 a) bioroot inlay retrieved out of putty mould b) immediate IOPAR post placement and c) 3 months follow up

DISCUSSION

An open apex, also known as a blunderbuss canal, refers to the incomplete closure of the root apex resulting from halted root development. This leads to an altered canal morphology. Nonsurgical management typically involves endodontic treatment through apexogenesis or apexification using materials such as MTA, Biodentine, or calcium hydroxide, followed by obturation with gutta-percha. The surgical method, on the other hand, involves apicoectomy and root-end filling before final obturation. However, surgical intervention in immature nonvital teeth carries disadvantages such as increased risk of crack formation during retrograde cavity preparation or during condensation of the filling material.

Orthograde obturation remains the most common and preferred approach for managing teeth with wide open apices. However, the absence of a defined apical stop and challenges in achieving a proper three-dimensional adaptation of obturation materials, such as custom-fitted gutta-percha cones, often result in marginal gaps at the dentin interface. MTA was introduced as an alternative to improve apical sealing, as its slight expansion during setting helps establish a barrier. Although MTA exhibits bioactivity through the formation of a biologic apatite layer that chemically bonds to dentin, it has drawbacks such as high cost, extended setting time, need for multiple visits, and technique sensitivity.

To address these challenges, the BioRoot inlay technique was developed. This approach involves fabricating a prefabricated replica of the prepared canal that fits passively within the root space, allowing for precise three-dimensional sealing. The inlay ensures effective lateral and apical adaptation when used with a compatible sealer, forming a monoblock structure that strengthens the interface and improves sealing in wide open apices.

Biodentine, a bioactive material with mechanical and biocompatible characteristics similar to natural dentin, serves as an excellent substitute in various clinical situations such as perforation repair, resorption management, and apexification. Owing to its high alkaline pH and release of calcium and phosphate ions, it forms tag-like crystalline structures within the dentinal tubules, enhancing micromechanical retention. The Ca- and Si-rich interfacial layer formed by Biodentine has been reported to be significantly thicker than that formed by other materials (Bachoo I.K. et al., 2013). Moreover, its short setting time allows for single-visit treatment completion.

In the present case, an immature tooth with an open apex was managed using a BioRoot inlay fabricated with Biodentine. The inlay was placed within the canal to evaluate its sealing efficiency and biological advantages compared with other conventional treatment approaches.

CONCLUSION

The Biodentine BioRoot inlay technique provides an effective alternative for managing immature teeth with open apices. It ensures a reliable apical barrier, three-dimensional obturation, and favourable biological response, thereby offering a predictable and conservative treatment modality for such cases.

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