

Case Report

Management of wide-open apex using biodentine as BioRoot inlay: A case report

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ABSTRACT:

Aims and background: The establishment of an ideal apical barrier determines the success of endodontic treatment in open apex teeth. Biodentine is a calcium silicate-based cement having several advantages. Orthograde delivery of biodentine is technique-sensitive and retrograde placement requires surgical intervention. To overcome the disadvantages of placement techniques, an innovative technique was done to obturate the tooth with an open apex using a custom-fit prefabricated BioRoot inlay in this case report. **Case description:** In the present case, management of open apex with parallel dentinal walls has been done using biodentine as a BioRoot inlay. BioRoot inlay is an intraradicular custom-made prefabricated restoration which provides the three-dimensional seal of the root canal space and promotes an apical barrier formation in a wide-open apex. This BioRoot inlay, placed passively in the canal along with the Biodentine as sealer forming a monoblock. This sealer helps in sealing the discrepancies between the plug and the root, thus providing a three-dimensional seal which had shown good healing of periradicular bone. **Conclusion:** Biodentine BioRoot inlay provides proper apical seal, establishes three-dimensional obturation and promotes effective root-end induction.

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INTRODUCTION

The completion of root development and closure of apical foramen is usually occurring up to 3 years which is associated with numerous morphological and anatomical changes. Dental trauma, necrosis of the pulp associated with caries and periapical pathology during the maturation process of permanent teeth results in incomplete root formation and wide-open apex. Proper apical closure in wide open apex with parallel dentinal walls, major concern should be given for the establishment of ideal apical barrier between periodontium and root canal system which is achieved by means of calcium hydroxide and MTA material or apical surgery.

In open apex root end therapy, care should be taken to ensure the biocompatibility of the product used and to establish a favourable physiological and histological response during its use. Biodentine is a tricalcium silicate-based biomimetic material designed as dentin substitute for the repair of root perforations, apexification and retrograde root

filling. Its interactions with both hard and soft tissues prevents marginal leakage and provide protection to the underlying pulp by inducing tertiary dentin synthesis (Univ AM et al. 2016). Adhesion of Biodentine is higher than both MTA and calcium hydroxide. Camilleri J et al. (2011) have shown apposition of hydroxyapatite on the Biodentine surface when exposed to tissue fluids.

The orthograde placement of biodentine is usually cumbersome and necessitates several radiographic confirmations. The retrograde delivery of biodentine can be done only by surgical method. In order to utilize the positive benefits of biodentine and negotiate the disadvantages of the placement procedure by obturating the open apex tooth with the custom-fit prefabricated BioRoot inlay. BioRoot inlay is an intraradicular custom-made prefabricated restoration which provides the three-dimensional seal of the root canal space and promotes an apical barrier formation in a wide-open apex.

The aim of the present article is to report the successful closure of root apex in a pulpless permanent maxillary central incisor with wide open apex using Biodentin bioroot inlay.

CASE REPORT

A 23-year-old male patient presented to the Department of Conservative Dentistry and Endodontics, of Punjab Government Dental College & Hospital, Amritsar with the chief complaint of discoloration of the upper anterior tooth for about last 1 month (Fig.1). The patient had a history of trauma 6 years ago. Intraoral examination showed that the right upper central incisor was discoloured and traumatic. The tooth did not respond to pulp vitality test. Intraoral periapical radiograph of 11 revealed a wide-open apex with thin apical dentinal walls (Fig.2).

Access cavity was initiated under rubber dam and working length was determined and confirmed with a periapical radiograph (Fig.3,4 & 5). Minimal circumferential filing was carried out with 3% sodium hypochlorite (NaOCl). The canal was dried and calcium hydroxide intracanal medicament was placed in the canal. Access cavity was sealed with temporary restorative material (Cavit).

The patient was reviewed after a month and was asymptomatic. The intracanal medicament was

removed by instrumentation and irrigation with 3% NaOCl and 17% ethylenediaminetetraacetic acid (EDTA). The canal was dried. Light body impression of the root canal space was made with the Avue gum light body elastomeric silicone impression material loaded on the master file [Fig.6(a), (b)]. The light body impression of the root canal space was placed in a putty impression material.

Biodentine powder was taken on the glass slab surface, and five drops of liquid were added to the powder. The powder and liquid were mixed for about 30 seconds, and hence the biodentine mixture was obtained. Initially, a small amount of mixture was placed into the mold using a condensor. It was then gently moved towards the apical portion using a root canal plugger. The mixture was added in minor increments to make a single plug of proper thickness to fill the mold (Fig.7). It was left in the mold space for about 15 minutes to achieve the proper setting. Putty impression was split into two halves to aid in retrieving Biodentine as a single plug (Fig.8). The finally prepared BioRoot inlay was inserted into the canal and sealed with biodentine sealer and the obturation was finished [Fig.9 (a), (b)]. Resolution of periapical lesion was observed 6 months. The periapical areas revealed satisfactory radiographic evidence of bone healing (Fig.10,11 & 12).



Fig.1-Pre-Operative Clinical Photograph



Fig.2-Pre-Operative Radiograph

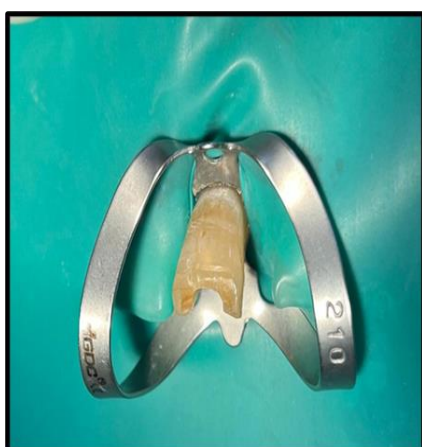


Fig.3-Isolation of tooth w.r.t.11

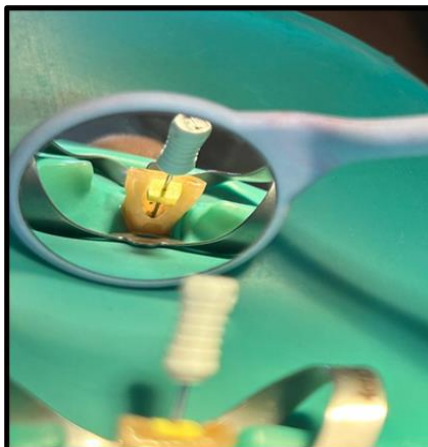


Fig.4-Clinical photograph of access opening



Fig.5-IOPAR showing working length determination

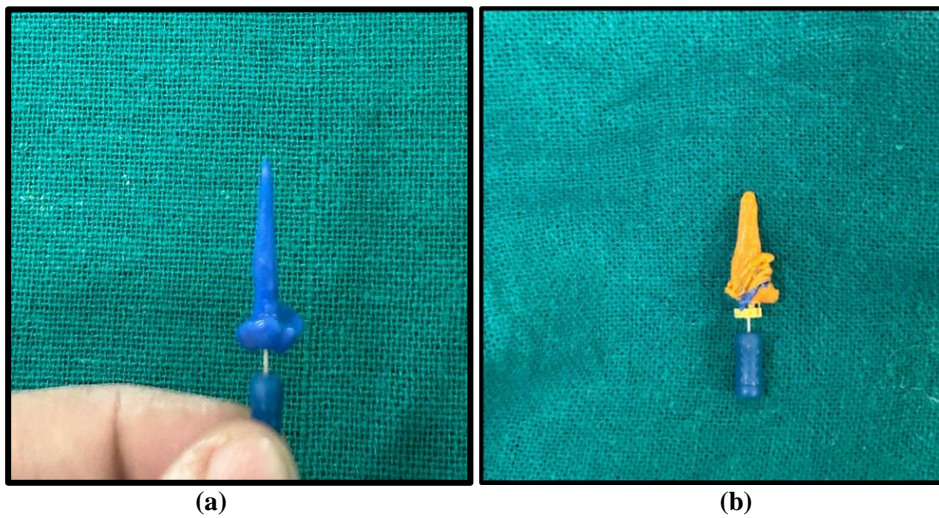


Fig.6(a), (b)-Photograph showing light body impression of the root canal



Fig.7-Biodentine added in minor increments in the mold space



Fig.8-Putty impression was split into two halves



(a) (b)
Fig.9 (a), (b) -Bioroot inlay was placed in the canal



Fig.10-Post- Operative Radiograph



Fig.11-IOPAR after 6 months



Fig.12-IOPAR after 12 months

DISCUSSION

Open apex refers to incomplete closure of the root canal apex due to insufficient root formation, which results in a difference in canal morphology. It is also called a blunderbuss canal. The nonsurgical approach includes endodontic root canal procedure, which includes apexogenesis or apexification with MTA, biodentine, or calcium hydroxide which later on finished with obturation by gutta-percha. The surgical approach includes apicectomy followed by root-end filling which is later finished with obturation by gutta-percha. The disadvantages of surgical intervention in the young pulp less tooth is intense crack formation during retro cavity preparation or condensation of the filling material.

The orthograde placement of obturation materials is the most common and preferred technique for managing wide open apex. Lack of definite apical stop, difficulty in achieving three-dimensional adaptation of custom-fitted gutta-percha and orthograde placement of restorative material leads to marginal gaps at the dentinal interface. In order to achieve the proper apical seal MTA was considered an alternative as it forms a barrier that achieves apical seal by mild expansion during setting. The porosity in set MTA allows the penetration of bacteria or their by-products; however, studies have shown that after MTA placement, a layer of hyaluronic acid which is known as biologic apatite forms over the material that fills the voids and surface defects and it develops a chemical bond between MTA and the dentinal walls showing the material's bioactivity. The main drawback of this material was the high cost, the necessity of two visits, and technique sensitivity based on its setting and handling.

An innovative approach, a BioRoot inlay was done to overcome the disadvantages of various management options of open apex with parallel dentinal walls. BioRoot inlay is the prefabricated replication of the prepared intraradicular canal, which helps in the three-dimensional sealing of the root canal and creates

the proper apical barrier in the wide open apex. This BioRoot inlay placed passively in the canal had a good seal laterally and apically along with the sealer forming a monoblock.

Biodentine is a bioactive agent with mechanical and biocompatible properties similar to dentin. It is used as a dentin substitute in root during the repair of perforation, external and internal resorption and apexification. Biodentine has high alkaline pH and calcium and phosphorus ion release has the ability to create a tag like crystalline structure within the dentinal tubules which may contribute to the micromechanical bond between dentin. The thickness of the Ca- and Si-rich layers was significantly larger in biodentine (Bachoo I.K. et al 2013). The setting time of biodentine is less and the completion of treatment is possible on the same day.

In the present study, a case of immature open apex tooth was managed with a BioRoot inlay prepared with biodentine as placed in a canal to study its benefits and added advantages when compared with other treatment options.

CONCLUSION

Biodentine as BioRoot inlay has been shown to induce faster periapical healing, establishes three-dimensional obturation and proper apical seal. Hence, it can be considered as the effective and definitive alternative for nonsurgical and surgical approaches for treating open apex.

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