Periodontics and Prosthodontics
ISSN: 2471-3082

Open Access Case Report

Management of Permanent Immature Necrotic Tooth with Biodentine: A Case Report

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ABSTRACT

Traumatic injuries in children are a frequent problem with the upper central incisor as the most affected tooth. Endodontic management of the immature permanent tooth with incomplete root formation and necrotic pulp is a challenge in endodontics. Apexification procedure is an endodontic treatment option for management of immature permanent tooth with open apex.

The case report describes the successful apexification treatment of a 9 years old girl patient with immature maxillary central incisor and crown discoloration, with the use of Biodentine as an apical barrier matrix. Dental history of discontinued endodontic treatment 1 year back was remarked. A 12 months follow up using standardized digital radiographs revealed restored aesthetics and function, absence of clinical signs.

Keywords: Apexification; Permanent immature tooth; Biodentine; Traumatic injury; Endodontics

INTRODUCTION

Dental traumatic injuries to young permanent teeth are frequent, and mostly occurs before completion of the root formation, and often results in pulpal inflammation or necrosis [1,2]. Further, many complications can be lead such as interruption of dentin formation and cessation of root development [3]. Therefore, endodontic management of such teeth imposes a great challenge because of thin dentinal walls and wide open apex make biomechanical debridement and obturation difficult [4].

Apexification is procedure for treating immature permanent tooth with open apex. It is means a method to induce a calcified barrier in a root with an open apex or continued apical development of an incompletely formed root in teeth with necrotic pulp tissue [5].

For many years, calcium hydroxide paste was used to induce a calcified barrier followed by root canal therapy [6]. MTA is commonly used nowadays as a material of choice for apexification. One of the major problems posed by MTA is handling properties and long time to set [7]. Not long ago, a new calcium silicate based material, biodentine (Septodont, France), has been introduced which was designed as a “dentin replacement” material with properties similar to MTA without its disadvantages [8]. The aim of the present article is to report the successful management of a maxillary central incisor wide open apex using biodentine.

CASE PRESENTATION

A female, aged 9 years reported to our department of pediatric dentistry, dental consultations and treatments

Received:	09-March-2023	**Manuscript No:**	IPPDPD-23-15857
Editor assigned:	13-March-2023	**PreQC No:**	IPPDPD-23-15857 (PQ)
Reviewed:	27-March-2023	**QC No:**	IPPDPD-23-15857
Revised:	09-May-2023	**Manuscript No:**	IPPDPD-23-15857 (R)
Published:	16-May-2023	**DOI:**	10.36648/2471.3082.23.9.009

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Citation: Najoua A, Chhoul H, Hessissen H (2023) Management of Permanent Immature Necrotic Tooth with Biodentine: A Case Report. Periodon Prosthodon. 9:009.

center, Mohammed V university in Rabat, Morocco. Her main complaint was pain related to tooth 21 as well as esthetic problem. The dental history revealed a trauma to the anterior maxillary region at the age of 7 years. The patient promptly provided a history of root canal therapy which was performed one year ago by a dental quackery. She did not present any systemic, local genetic diseases or medication history. The extra oral examination was normal. Intraoral examination revealed defective resin composite restoration on teeth 21, and showed an access cavity already done, with a clear discoloration (**Figure 1**). The vitality of the tooth was determined by the cold thermal testing, using dry ice. It revealed the negative response, whereas response was obtained on adjacent teeth. The tooth was tender to percussion with a physiological mobility.

Figure 1: Preoperative intraoral view of the anterior maxillary region: Observe the defective restorations and discoloration on tooth 21.

The radiographic examination of the tooth revealed incomplete obturation of the canal with an immature open apex, a marked lateral radiolucency between teeth 11 and 21, an irregular margin and loss of lamina dura (**Figure 2**).

Figure 2: A preoperative periapical radiograph: Observe open apex of tooth 21 with radiolucent area between teeth 11 and 21 and an incomplete obturation of the canal.

The diagnosis was a chronic apical periodontitis with an open apex. Apexification with Biodentine was planned as a treatment option. The setting period of the material is short (9-12 minutes) in contrast with MTA which is 2 hours 45 minutes. This quicker setting minimizes the risk of bacterial contamination and eliminates the need for a two-stage filling as with TMA. This avoids the patient a lot of back and forth [9].

The endodontic treatment started with the isolation of the tooth with a rubber dam, access to the pulp chamber was completed and a foreign object like a wooden wedge was removed from the canal. Then, the Working Length (WL) was easily determined using a file in place radiograph. The canal was then cleaned and shaped gently using rotary protaper under NaOCl 2.5% irrigation and dried using paper points. Calcium hydroxide was placed in order to obtain disinfection of the root canal, and removed after 2 weeks (**Figure 3**).

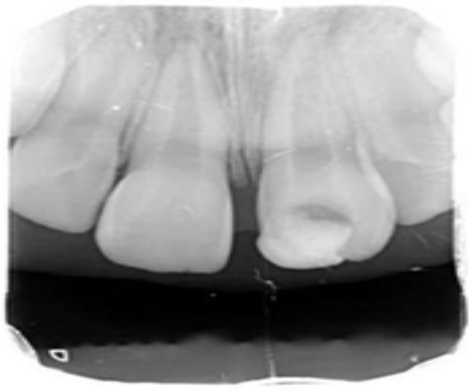

Figure 3: Root canal desobturation.

Biodentine was mixed according to manufacturer's instructions; it was obtained by adding 5 drops of fluid to the powder and triturating for 30 seconds in electric amalgamator. Then, it was carried into the canal using amalgam carrier and condensed to obtain a 5 mm apical plug using hand pluggers.

To check the correct position of the biodentine mixture, an X-ray control was done immediately. On this radiograph, we can see the low radiopacity of biodentin which appears close to that of dentin.

The rest of the canal was obdurate with thermoplastic zed gutta-percha. On the recall visit, post endodontic restoration with composite was done. The final result can be seen in (**Figures 4 and 5**).

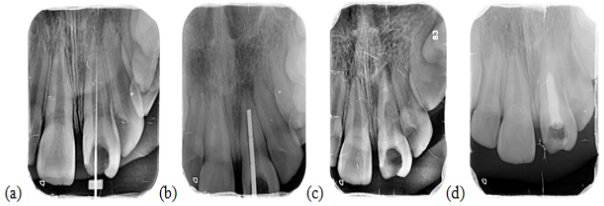

Figure 4: (a) Working length radiograph; (b) Radiograph confirming the placement of the hand pluggers; (c) Radiograph confirming the placement of Biodentine apical plug; (d) Backfill performed using thermoplastic zed gutta-percha.

Figure 5: Postoperative clinical image.

One year follow-up revealed the patient remained asymptomatic with restored esthetics and functions.

DISCUSSION

According to the American association of endodontist's glossary of endodontic terms, apexification is defined as "a method of inducing a calcified barrier in a root with an open apex or the continued apical development of an incompletely formed root in teeth with necrotic pulp" [10]. Different materials have being proposed for the apical plug formation.

Traditionally, calcium hydroxide was the most common material used in apexification [11]. Chowdhury AFMA., thanks to its ability to induce the formation of a calcifed apical barrier. However, despite its success, technical apexication with this material has many inconveniences. It requires multiple visits and a long term to obtain the apical barrier (6 to 24 months), recontamination of the root canal system during treatment periods is likely. It can lead also to a high risk of root fractures [12]. With the discovery of MTA, it becomes the material of choice for apexification. MTA is bioactive cement with the capacity to induce the formation of new cementum and periodontal ligament. The advantages of MTA apexification are: Low solubility, excellent biocompatibility, greatest radiopacity. It may also be able to reduce the number of clinical sessions thus offering the possibility to restore the tooth with a minimal delay [13]. But does not allow the root edification, and the root fragility persists, it also presents a poor handling characteristics, discoloration potential and high cost.

Recently, Biodentine with active biosilicate technology was introduced in 2010, as a new class of dental material. Biodentine is a Tricalcium Silicate (Ca_3SiO_5) based in organic restorative commercial cement and advertised as 'bioactive dentine substitute' [14]. It is characterized by a compressive strength, elasticity modulus, and micro hardness comparable with that of natural dentine (add the values comparatives). A micromechanical bond between dentin and this novel material can be observed thanks to the creation of a tag like crystalline structure within the dentinal tubules. In addition, Biodentine has a shorter setting time of 12 min as compared with that of MTA (2 hours and 45 min). Then, the completion of treatment on the same day is made possible unlike MTA, which requires a two-step technique. The biodentine has the ability of creating a tag like crystalline structure within the dentinal tubules which may contribute to the micromechanical bond between dentin and novel calcium silicate material [15]. The presented case shows a management of an immature permanent tooth with the latero-apical lesion, with one-year follow-up using biodentine for apexification (**Figure 6**).

Figure 6: One year follow-up.

The aim of our treatment is to exploit the best of both, calcium hydroxide and Biodentine properties. Calcium hydroxide was used, for 15 days, as a temporary obturation materiel in order to obtain disinfection of the root canal, and periapical healing, without his adversely affect the fracture resistance of the tooth. Whilst, Biodentine was used as an artificial apical barrier.

CONCLUSION

Apexification treatment with biocompatible materials such as Biodentine can be considered an effective treatment option for teeth presenting open apices. This is due to its excellent physical, mechanical, and biochemical properties, along with superior clinical handling capabilities. However, in such cases, long term follow up is necessary to ensure and evaluate success.

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