Case Report

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One Step Apexification an a Resorbed Tooth Using Autologous Prf as Internal Matrix and Biodentine Apical Plug

Abstract:

Apexification is defined as a method to induce a calcific barrier in a root with open apex or the continued apical development of an incompletely formed root in teeth with necrotic pulp tissue. The presented case was of a 26-year-old male patient with discoloured tooth associated with external resorption and periapical pathology in relation to the upper front right tooth. Teeth with open apex due to root end resorption pose difficulties during endodontic treatment because of the wide-open root apex and thin dentin walls. Thisarticle describes the procedure of single-visit apexification using a new calcium silicate-based material (Biodentine) as an apical barrier along with platelet-richfibrin as internal matrix.

Key-words: One-step-apexification, Platelet-rich-fibrin, Biodentine

Introduction:

Apexification is the process of induction of calcific barrier in a root with open apex or the continued development in the apical region in an immature tooth with necrotic pulp. The traditional approach to the procedure of apexification involved the induction of formation of an apical barrier while, in the recent times, an artificial apical barrier is formed by the placement of various materials which included tricalcium phosphate, freeze-dried bone, freeze-dried dentin, mineral trioxide aggregate (MTA) and biodentine.[1]

However, these materials have a tendency to extrude beyond the apex and impinge on the periodontal tissue causing potential tissue sensitivity. The matrix acts as an artificial barrier providing an apical stopagainst which sealing material can be placed and packed. Hence, an apical matrix helps in the controlled compaction of MTA similar to the "modified matrix concept" where perforation repair was performed using resorbable collagen as a matrix before placement of MTA.[2] Several materials proposed to create a matrix include calcium hydroxide, absorbable collagen, hydroxyapatite, and autologous platelet-rich fibrin (PRF) membrane.Recently, a new biomimetic or dentin replacement material (Biodentine) has been introduced with properties similar to MTA without its disadvantages that can be used to induce the artificial barrier for apexification.[3]

One step apexification can be described as a nonsurgical compaction of a biocompatible material into the apical end of the root canal to establish an apical stop that would enable the immediate filling of the root canal.[4]

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An open apex due to the external inflammatory resorption can be successfully managed by using PRF as an internal matrix and biodentin, as shown in this case report.

Thus, the aim of the present case report is to present the successful closure of root apex in a permanent maxillary central incisor using Biodentine in combination with PRF.

Case Report:

A 26 -year-old male patient reported with a chief complaint of discoloured teeth and pain in the upper front right tooth. Patient gave a history of trauma 8 years back. Intraoral clinical examination revealed discoloration in relation to 11 [Figure 1].

Figure 1: Preoperative clinical picture

No swelling or pus discharge was seen in relation to the concerned tooth and no relevant dental or medical history was found. Radiographic examination revealed an open apex along with a periapical radiolucency in relation to 11 [Figure 2].

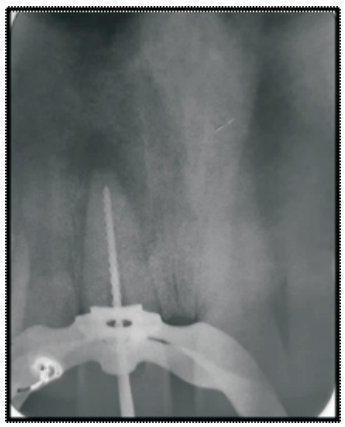

Figure 2: Preoperative Radiograph

The tooth was found to tender to palpation and percussion on examination. On thermal and electric pulp testing, a negative response was found. Thus, a diagnosis of pulpal necrosis with periapical periodontitis was made in relation to 11.

After isolation using rubber dam, access opening was done and working length was determined and kept 1 mm short of radiographic apex [Figure 3].

Figure 3: Working length radiograph

The biomechanical preparation was done with K-files (Dentsply Mallifer, Ballaigues, Switzerland) using step back preparation technique. Root canal irrigation was done using 3% Sodium Hypochlorite (NaOCl) between the sequential use of instruments followed by 17% Ethelyne diaminetetraaceticacid (EDTA) and saline. Sterile paper points were used to dry the root canal and an intra canal dressing of Calcium Hydroxide was given. The access cavity was then sealed using a temporary restorative material.

After a week in the subsequent appointment, under isolation, calcium hydroxide dressing was removed by H file and irrigating with alternating solutions of 3% Sodium Hypochlorite(NaOCl) and 17% EDTA and a dressing of triple antibiotic paste was given in relation to 11.

In the next appointment after 7 days, the dressing was removed with and H file and a final irrigation with sterile saline was done. The root canal was then completely dried using sterile paper points.

Simultaneously, PRF membrane was prepared. A 10 ml sample of whole blood was drawn from the patient and immediately poured into a sterile glass test tube without anticoagulant and then centrifuged at 3000 revolutions per minute for 10 min. The centrifuged component obtained comprises of three layers: the uppermost layer of acellular platelet poor plasma, PRF clot in the middle layer, and red blood cells at the bottom of the test tube. (Figure 4).

The freshly prepared PRF membrane (Figure 5) was placed into the root canal and gently compacted using hand pluggers to achieve a matrix at the level of the apex (Figure 6).

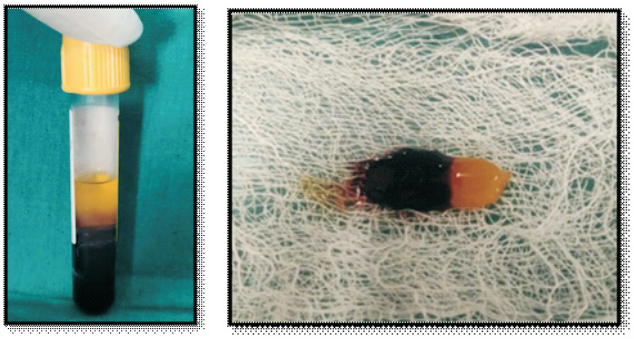

Figure 4 & 5: Prepared PRF Membrane

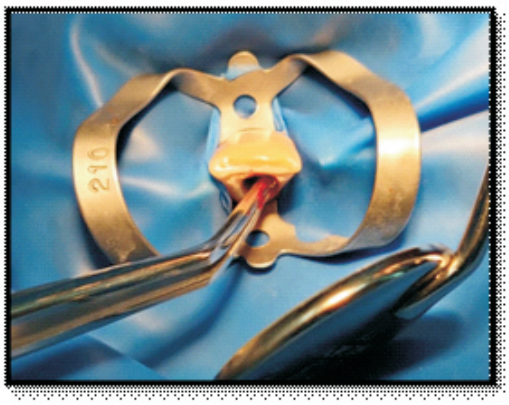

Figure 6: Intra-operative picture depicting biodentine placement

The mixed Biodentine was carried into the canal with the help of a carrier and was condensed against the PRF matrix using hand pluggers to form an apical plug of 4 mm thickness, which was then confirmed radio graphically [Figure 7].

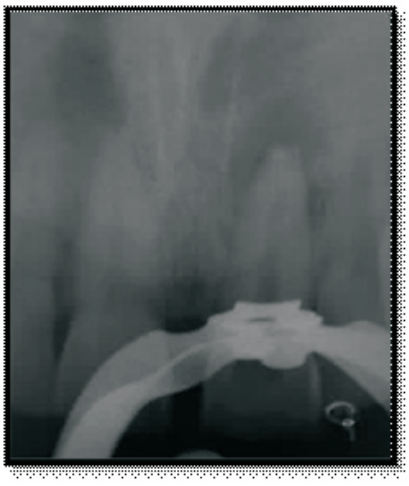

Figure 7: Radiograph depicting biodentine plug

After 12 minutes, the hardness of the biodentine was examined using a plugger which confirmed its set. The canal was backfilled with the rmoplastized gutta-perchawith AH plusresin sealer [Figure 8& 9].

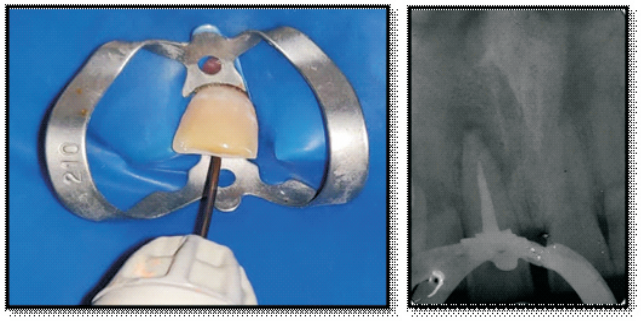

Figure 8 & 9: Intraoperative and Radiographic picture depicting obturation

The access cavity was then restored with a composite restoration (Figure 10).

Figure 10: Immediate Post-operative radiograph

Discussion:

Inflammatory resorption is a pathological process that takes place within the pulp chamber of the root canal system and associated with loss of periradicular dentin and inflammation in the periapical area leading to root resorption.[5]Studies have shown that PRF clot forms a strong fibrin matrix and shows potential as a healing matrix.

PRF has optimum wound healing potential owing to the fact that it is autologous, biocompatible and immune fibrin biomaterial. It allows rapid angiogenes is and quicker remodelling offibrin network. It also aids in the stimulation of

osteoblasts, fibroblasts and periodontal ligament cells and leads to the activation of dental pulp and periodontal ligament stem cells. This property is attributed to the release of several growth factors such as platelet-derived growth factor and transforming growth factor.[6]

Autogenous materials are offered preferred over synthetically manufactured counterparts as there is minimal possibility of allergic reactions with enables them to aid in adequate wound healing.

Moreover, using a matrix avoids the extrusion of the material into the periodontal tissues. Biodentine is a new biomimetic material, in which contains tricalcium silicate, dicalcium silicate, calcium carbonate, calcium oxide, zirconium oxide as components of the powder while the liquid component comprises of a water-soluble polymer and calcium chloride. Biodentine has a shorter setting time of 12 minutes, as compared with that of MTA, which is 2 hours 45 minutes.[7]The mechanical properties of Biodentine are similar to those of natural dentine. The compressive strength, elasticity modulus and microhardness are also similar to that of natural dentine. Zanini *et al.* also suggested that Biodentine is bioactive because it induces differentiation of odontoblast-like cells and increases murine pulp cell proliferation and biomineralization.[8] Studies have also revealed that Biodentine when used in direct pulp capping led to the formation of a dentinal bridge and osteoblast like cells. It has also been shown to lack cytotoxicity, and it is able to stimulate collagen fibre and fibroblast formation.

Conclusion:

A combination of PRF as a matrixand Biodentine as an apical barrier is a good option for creatingartificial root-end barrier especially in cases of open apex due to root end resorption. However, further controlled clinical trials are necessary to investigate the predictability of the outcomeof this technique.

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