Case Report
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A NOVEL COMBINATION OF INJECTABLE PLASMA RICH FIBRIN AND BIODENTINE FOR THE ENDODONTIC MANAGEMENT OF A TOOTH WITH AN OPEN APEX AND PERIAPICAL LESION- A CASE REPORT

Dental Science

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ABSTRACT

Trauma to a tooth during development might result in an open apex with pulpal necrosis followed by a periapical lesion. Single visit monoblock obturation with Biodentine along with a supply of growth factors through injectable plasma rich fibrin may prove useful for the predictable management of teeth with open apices. In addition, it may be considered as an alternative to the traditional apexification and obturation methods used. This report demonstrates the management of an open apex with periapical radiolucency in a maxillary left central incisor using Biodentine as an apical matrix barrier and obturating material.

KEYWORDS:

Open apex, triple antibiotic paste, injectable plasma rich fibrin, Biodentine.

INTRODUCTION

In permanent teeth, root development and closure of the root apex continues until three years post eruption (1). The occurrence of any trauma, caries or other pulpal pathosis during this period results in roots with wide canals and fragile walls accompanied by an open apex due a halt in dentine formation. Root canal instrumentation in such roots is impaired, and an adequate apical stop for condensing the filling material is unachievable.

Over three decades, platelet concentrations from autologous sources have been used as regenerative tools because of their ability to release supraphysiological doses of growth factors required for the induction of tissue regeneration (2, 3). Among them, platelet-rich fibrin (PRF), first termed by Choukroun et al. in 2001, was developed as a second generation autologous platelet concentrate without the use of any anticoagulants (4). PRF is a rich source of the growth factors found in platelets. These growth factors are involved in wound healing and are presumed to act as promoters of tissue regeneration (5, 6).

Biodentine (Septodont, Saint-Maur-desFossés, France) is a new, recently introduced, calcium silicate-based cement similar to mineral trioxide aggregate (MTA) (7). The physical and chemical properties of this material are similar to that of certain Portland cement derivatives. Due to its high biocompatibility (8), Biodentine™ has been claimed by manufacturers to be a more user-friendly bioactive dentin substitute (9).

Herein, we highlight the management of a maxillary left central incisor with an open apex and periapical radiolucency using a combination of injectable plasma rich fibrin (i-PRF) and Biodentine as a single visit, monoblock, obturating material.

CASE STUDY

A 21-year-old male patient was referred to the Department of Conservative Dentistry and Endodontics, SVS Institute of Dental Sciences, India, for the treatment of a maxillary left central incisor. The patient complained of pain in the upper front tooth, which was fractured due to trauma at the age of 8 years. His medical status was non-contributory. Intra oral examination revealed that tooth #9 was tender to percussion and palpation. Electric pulp test and cold application yielded negative results. The tooth was discoloured with an access cavity filled with a temporary filling; there was no evidence of swelling or a sinus tract in relation to the tooth (Fig. 1). Radiographic examination revealed an immature tooth with a wide and open root apex and a radiolucency near the apex of the tooth (Fig. 2a).



Figure 1. Preoperative photograph showing Elli's Class IV fracture with discolouration in relation to #9.

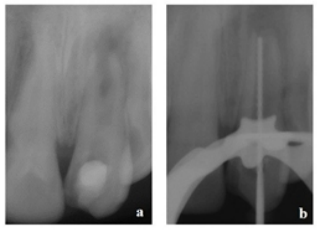


Figure 2: a) Preoperative radiograph, b) Working length determination.

Based on these findings, a diagnosis of open root apex with periapical abscess in relation to tooth #9 was reached. Informed consent was obtained from the patient and an access cavity was prepared using an Endo Access bur (Dentsply Maillefer, Ballaigues, Switzerland) under rubber dam isolation. The working length was determined radiographically (Fig. 2b).

Chemo mechanical preparation was performed with a 80# K-file (Dentsply Maillefer Ballaigues, Switzerland) using a circumferential filing motion. The root canal was debrided with 3% sodium hypochlorite (NaOCl; Cmident, Cmident, New Delhi, India), 17% ethylenediamine tetraacetic acid (EDTA smear clear, SybronEndo, CA, USA) and saline. Triple antibiotic paste (TAP), was prepared by mixing metronidazole, ciprofloxacin, and minocycline (1:1:1) in propylene glycol and used to disinfect the root canal space. After drying the root canal with sterile paper points, TAP dressing was placed and the access cavity was temporarily closed with IRM (Caulk, Dentsply, Milford, DE). The patient was recalled for three weekly appointments to change the TAP dressing.

At the end of the fourth session, the canal was completely dry, and the patient was asymptomatic. The tooth was isolated with rubber dam and TAP was removed from the canal by hand instrumentation. Irrigation was performed with 3% NaOCl (Cmident), 17% liquid EDTA Smear Clear (SybronEndo) and saline followed by drying the root canal with sterile paper points. The periapical area and root canal were rinsed with i-PRF to provide the growth factors.

To obtain the i-PRF, the patient's blood was withdrawn with a syringe and transferred to a 9 ml tube without any additive (Dry Vacutube, Biocon®, Brazil). The tube was then horizontally centrifuged (B-40, RDE®, Brazil) for 2 min at 2,700 rpm (5) resulting in the separation of the contents into an orange coloured liquid in the upper part (i-PRF) and the remaining blood materials below. i-PRF was carefully collected using a 2ml syringe (Injex®, Brazil) and injected immediately into the periradicular lesion, allowing the excess to flow

out (Fig. 3a).

Biodentine was manipulated by pouring five drops of Biodentine liquid from a single-dose dispenser into a Biodentine capsule™ (Septodont), which was placed in a triturator for 30 s. The material obtained after trituration was collected, and delicately inserted into the root apex using a root-canal plugger (Fig. 3b).



Figure 3. a) i-PRF injected into the canal, b) Tooth being obturated with Biodentine.

Several increments were required to obturate the canal completely following which, composite resin was used to seal the access cavity. A radiograph confirmed the completion of the single visit monoblock obturation for the open apex (Fig. 4a). A post endodontic crown was not provided for the patient because he was planning to undergo orthodontic treatment for correction of misaligned teeth.

A 6-month follow-up showed no clinical symptoms. Radiographic examination revealed complete periapical healing and regeneration of the periradicular tissues (Fig. 4b).

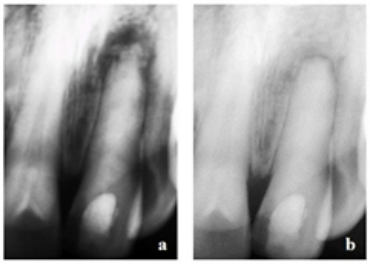


Figure 4. a) Post monoblock obturation, b) Six months post-operative.

DISCUSSION

Many materials have been proposed for the closure of an open root apex. Non-setting calcium hydroxide was first used by Kaiser in 1964 (10); subsequently, calcium hydroxide was suggested for use as a permanent apical barrier (11-13). However, the disadvantages of this material include the unpredictable time required for apical barrier formation, patient compliance, need for multiple appointments, re-infection following loss of temporary restoration, and tendency for tooth fracture (14-16). Moreover, the apparently calcified barrier has been found to be porous and may sometimes contain small amounts of soft tissue (17). Hence, the use of a single visit apical closure seems to be a suitable alternate treatment option for open apex cases.

After the discovery of MTA by Torabinejad et al (18), it has become the material of choice for single visit apexification procedures in combination with canal back fill using gutta percha. Despite its many advantages such as biocompatibility, sealing ability, and cementogenesis, disadvantages such as long setting time, poor handling characteristics, and high cost resulted in the search for a new material.

Biodentine, was introduced by Septodent in September 2010 as a permanent dentine substitute material for damaged dentine. It was, subsequently, made available for use in January 2011 with a composition similar to that of MTA. This material is available in powder and liquid forms, the powder mainly consists of tricalcium and dicalcium silicate similar to the principle components of Portland cement and MTA. In addition, it also contains calcium carbonate, calcium oxide, iron oxide, and zirconium oxide. The liquid form consists of calcium chloride and a water-soluble polymer. Biodentine has a comparatively shorter setting time of 12 min when compared to that of MTA, which is 2 h and 45 min (19, 20).

i-PRF is known for the release of several growth factors such as interlukin-1 (IL-1), IL-6, IL-4, tumour necrosis factor alpha (TNF alpha), vascular endothelial growth factor (VEGF), transforming growth factor β1 (TGF β1), platelet derived growth factors (PDG), and insulin like growth factors (IGFs) (21), which are required for the regeneration of periradicular tissues, especially in open apex cases. This property of i-PRF was utilized in the present study for the regeneration and fast healing of periradicular tissues.

CONCLUSIONS

Resolution of periapical rarefaction and appearance of bony trabeculae with a thin layer of calcified tissue adjacent to the Biodentine barrier was observed during the 6-month recall period. The patient was asymptomatic with sound periodontal health. However, long-term follow-up is required in this case. Moreover, further studies using Biodentine monoblock obturation in combination with i-PRF for the non-surgical management of teeth with open apices and periapical lesions are merited.

REFERENCES:

1. Bhasker SN. Orban's oral histology and embryology. 11th ed. St. Louis: Mosby-Year Book; 1991. p. 382.
2. Chow TW, McIntire LV, Peterson DM (1983) Importance of plasma fibronectin in determining PFP and PRP clot mechanical properties. Thromb Res 29:243–248 2.
3. Delaini F, Poggi A, Donati MB (1982) Enhanced affinity for arachidonic acid in platelet-rich plasma from rats with adriamycininduced nephrotic syndrome. Thromb Haemost 48:260–62
4. Choukroun J, Adda F, Schoeffler C, Vervelle A. Une opportunité en paro-implantologie: le PRF. Implantodontie 2001;42(55):e62.
5. Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J, Gogly B. Platelet-rich fibrin (PRF): a secondgeneration platelet concentrate. Part II: plateletrelated biologic features. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;101:e45-50.
6. Choukroun J, Diss A, Simonpieri A, Girard MO, Schoeffler C, Dohan SL, Dohan AJ, Mouhyi J, Dohan DM. Platelet-rich fibrin (PRF): a second-generation platelet concentrate. Part IV: clinical effects on tissue healing. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;101:e56-60.
7. Saidon J, He J, Zhu Q, Safavi K, Spångberg LS. Cell and tissue reactions to mineral trioxide aggregate and Portland cement. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2003;95:483-9.
8. Laurent P, Camps J, De Méo M, Déjou J, About I. Induction of specific cell responses to a Ca (3) SiO (5)-based posterior restorative material. Dent Mater 2008;24:1486-94.
9. Wongkornchaowalit N, Lertchirakarn V. Setting time and flowability of accelerated Portland cement mixed with polycarboxylate superplasticizer. J Endod 2011;37:387-9.
10. Richard J, Masako F, Maria H, et al. Injectable platelet rich fibrin (i-PRF): opportunities in regenerative dentistry? Clin Oral Invest 2017. doi: 10.1007/s00784-017-2063-9.
11. Kaiser JH. Management of Wide-Open Canals with Calcium Hydroxide. Paper Presented at the Meeting of the American Association of Endodontics, Washington, DC: 17 April, 1964.
12. Frank AL. Therapy for the divergent pulpless tooth by continued apical formation. J Am Dent Assoc 1966;72:87-93.
13. Coviello J, Brilliant JD. A preliminary clinical study on the use of tricalcium phosphate as an apical barrier. J Endod 1979;5:6-13.
14. Schumacher JW, Rutledge RE. An alternative to apexification. J Endod 1993;19:529-31.
15. Felippe MC, Felippe WT, Marques MM, Antoniazzi JH. The effect of renewal of calcium hydroxide paste on the apexification and periapical healing of teeth with incomplete root formation. Int Endod J 2005;38:436-442.
16. Metzger Z, Solomonov M, Mass E. Calcium hydroxide retention in wide root canals with flaring apices. Dent Traumatol 2001;17:86-92.
17. Andreasen JO, Farik B, Munksgaard EC. Long-term calcium hydroxide as a root canal dressing may increase risk of root fracture. Dent Traumatol 2002;18:134-7.
18. Binnie WH, Rowe AH. A histological study of periapical tissues of incompletely formed pulpless teeth filled with calcium hydroxide. J Dent Res 1973;52:1110-16.
19. Torabinejad M, Watson TF, Pitt Ford TR. Sealing ability of a mineral trioxide aggregate when used as a root end filling material. J Endod 1993;19:591-5.
20. Parirokh M, Torabinejad M. Mineral trioxide aggregate: a comprehensive literature review - Part I: chemical, physical, and antibacterial properties. J Endod 2010;36: 16-27.
21. Kavita H, Krishna S. Platelet rich fibrin - a novel acumen into regenerative endodontic therapy. Restor Dent Endod 2014. doi.org/10.5395/rde.2014.39.1.1