

Apexogenesis of a Carious Immature Premolar Tooth with help of PRF - A Case Report with 2 years Follow UP¹Dr. Shubhajoy Rakshit, ²Dr. Krishnendu Bhowmik, ³Dr. Swagata Das, ⁴Dr. Mohammad Ashiqur Rahman**Corresponding Author:** Dr. Shubhajoy Rakshit**Citation of this Article:** Dr. Shubhajoy Rakshit, Dr. Krishnendu Bhowmik, Dr. Swagata Das, Dr. Mohammad Ashiqur Rahman, “Apexogenesis of a Carious Immature Premolar Tooth with help of PRF - A Case Report with 2 years Follow UP”, Volume – 6, Issue - 2, P. No. 73 – 79.**Copyright:** © 2023, Dr. Shubhajoy Rakshit, et al. This is an open access journal and article distributed under the terms of the creative commons’ attribution non-commercial License. Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.**Type of Publication:** Case Report**Conflicts of Interest:** Nil**Abstract**

Tooth loss due to caries of a growing child is a tremendous loss which brings serious consequence to the oro-facial structure. At the age of the mixed dentition period the premature loss of early erupting premolar tooth is very dangerous due to migration of remaining anterior & posterior teeth in the edentulous space which ultimately leads to severe malocclusion. Immature developing tooth has a very large root canal which is very fragile makes impossible to do normal bio-mechanical preparation of files that leads to a very narrow treatment option. Normally now a days blander bass root canal can be treated either 1 step apexification by MTA or Apexogenesis. There is a very limited successful case that documented Apexogenesis of a lower mandibular premolar which suffered from caries that have undergone Regenerative Endodontic Treatment (RET) using 2nd generation platelet concentrate. Here we presented a case of an immature erupting premolar tooth with severe pulpal pain that was diagnosed pulpal involvement by caries. The Apexogenesis was done by

PRF and the tooth became asymptomatic. Radiographically & clinically all the follow up reveal an asymptomatic tooth with evidence of root developing. Further studies are recommended for long term follow up of Regenerative Endodontic Procedure (REP) done on premolar tooth.

Keywords: Apexogenesis, Platelet Rich Fibrin, Open apex, Vital Pulpotomy, Immature Permanent Teeth, Treatment**Introduction**

In children, primary dentition acts a very significant role in the child’s growth and development, as in terms of chewing, talking, aesthetics also in the guidance and eruption of permanent teeth [1]. Early exfoliation of primary teeth and eruption of permanent teeth is a normal physiological process [2]. If this usual process is disrupted, due to factors like early loss of primary teeth, proximal carious lesions, etc, it may guide to mesial migration of remaining teeth resulting in loss of the arch length which may obvious as malocclusion in permanent dentition in the appearance of crowding, impaction of

permanent teeth, supra eruption of conflicting teeth, etc [3]. However, if premature extraction or loss of a tooth is obligatory due to extensive caries or other reasons, the safest alternative to maintain arch space is by insertion a space maintainer.

During the mixed dentition period, completion of root development and closure of the open apex of permanent tooth takes up to 3 years after the eruption in the permanent dentition [4]. Treatment of immature teeth that have sustained injuries, caries resultant in either necrotic pulps or apical periodontitis, during this in-between period provides a momentous challenge for the clinician [5]. So, there are 2 options are available for treating such case like this-

1. Apexogenesis, 2. Apexification [6, 7]. Apexogenesis is a normal physiologic process of root development. The term is used to explain the endodontic procedure of conservation of pulp vitality. It has also been suggested that maturogenesis is a more suitable term than apexification since not only the apex but the complete root is allowed to mature [8]. Apexogenesis is a 'vital pulp therapy procedure performed to encourage continued physiological development and formation of the root end' [9]. Apexification is defined as a 'method to induce calcified barrier in a root with an open apex or the continued apical development of an incomplete root in teeth with necrotic pulps' [10].

Apexification can be done in either traditional calcium hydroxide method or one step apexification by MTA. Normally, during the 'apexification' procedure, placement of calcium hydroxide as an intra-canal medicament in the infected canal to eradicate the intraradicular infection and encourage an apical barrier requiring numerous visits and a protracted treatment, which normally time-consuming [11, 12]. On the other hand 1 step apexification procedure by MTA creating an

artificial barrier at the open apex to which a hard tissue barrier can readily form with the same comparable outcomes by using calcium hydroxide, but its main advantage is less time-consuming. Other than time consumption, MTA has the optimal sealing ability, bio compatibility, and ability to induce hard tissue and set in a moist environment [13-18].

Apexogenesis also can be achieved by indirect pulp capping, direct pulp capping, or by pulpotomy. Though normally Calcium hydroxide, form cresol (FC), mineral trioxide are being used as pulpotomy agents now Platelet Rich Fibrin (PRF) has changed the concept [19]. Regenerative endodontics has been defined as 'biologically-based procedures designed to physiologically replace damaged tooth structures, including dentin and root structures, as well as cells of the pulp-dentine complex' [10]. The use of PRF as a scaffold is a potentially ideal regenerative endodontic material that can be used in therapy has been documented in the literature [20].

Case Report

A 9 years old female patient came with the chief complaint of severe pain on her lower left jaw. On examination her no. 35 tooth was badly carious and IOPA-R reveals pulpal involvement of caries. Her medical history was non-contributory. The second premolar was not tender on percussion and severely responsive to the cold pulp sensibility test. In IOPA-R a very large open apex and severe loss of crown structure of the second premolar was noted by caries. Based on the clinical and radiographical examination the tooth was diagnosed with symptomatic pulpitis with a wide-open apex, and a very wide root canal (Blunderbuss canal).



Figure 1: (A) Picture showing severe tooth structure loss with tooth #35. (B) A preoperative radiograph showing pulpal involvement of tooth #35 by caries and a large wide pulp canal with wide open apex. (C) Rubber dam Isolation of the tooth and superficial caries removed by hand instrument. (D) Access opening done and infected pulp removal done.

As the tooth was immature and vital, Regenerative Endodontic Treatment (RET) was planned and the procedure was explained to the patient's guardian. Written consent was obtained.

The tooth was anesthetized with 2 % Lignocaine (1: 80,000 adrenalin) and isolated with a rubber dam. All the caries were removed from the tooth carefully with a slow speed air rotter handpiece with plenty of distilled water. During caries removal, bleeding started from the tooth as the tooth was already pulp ally involved by caries. Access opening was done by a large round bur and 1/3 of the infected pulp was removed by a sterilized large round bur in high-speed air rotter handpiece. The colour of the pulp had been changed from bright red to pinkish white. A sterile wet cotton pellet was placed over the freshly cut healthy pulp & bleeding also stopped within 3-4 min. After the removal of the cotton pellet, the pinkish-white pulp was seen without any blood clot. Normal saline was used to remove all the tooth debris

from the cavity and a wet cotton pellet was loosely placed over the pulp to prevent dehydration.

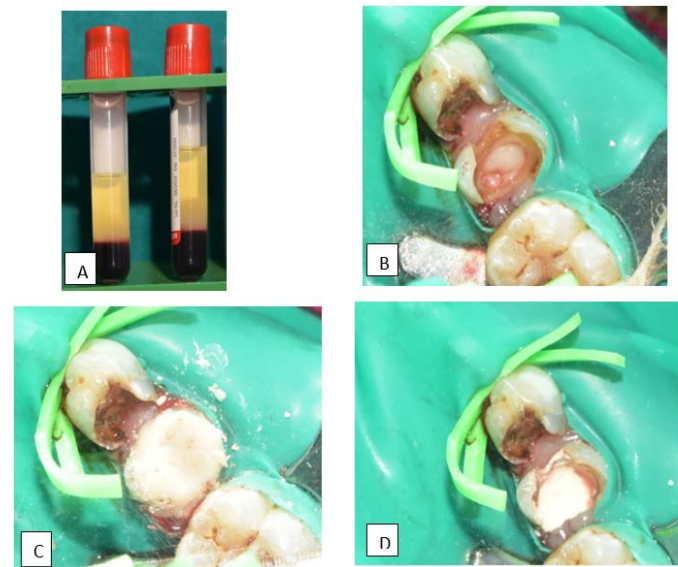


Figure 2: (A) PRF prepared from patient's own blood. (B) PRF placed over amputated pulp. (C) Bio dentin placed over PRF membrane. (D) GIC restoration done at same appointment

10 ml of whole blood was collected from the patient's body into a sterilized test tube and centrifuged it in 3000 rpm for 10 min on a tabletop centrifugal machine (Remi C-852, India). 3 distinguishable layers were formed in the test tube from which a 5 ml Dispovan was used to collect superficial clear layer from the test tube for future use. A straight sterile needle holder was used to collect the PRF layer and a scissor was used to cut the peripheral RBC layer from PRF. The PRF was collected on a surgical gauze piece to wrap the PRF and squeezed it slightly to form a plug.

The cotton pellet was removed from the operated tooth and the pulp chamber was irrigated gently with the clear liquid that was collected previously in the Dispovan from the test tube. The prepared PRF plug then placed over the pulp, without any extra pressure the whole pulp was then covered by PRF slowly by a ball burnisher.

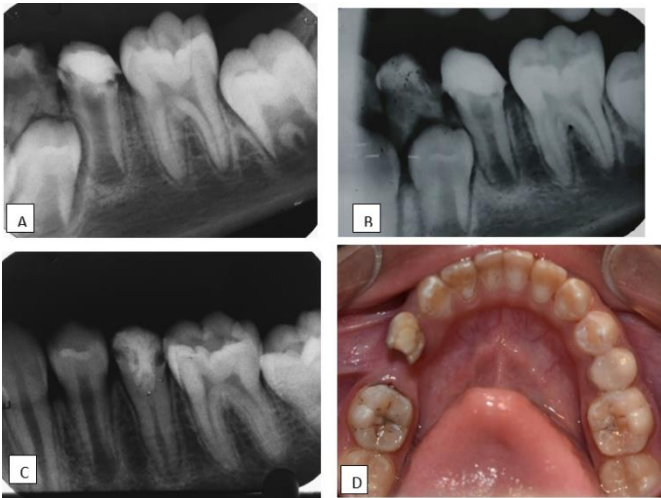


Figure 3: (A) Immediate radiograph of the tooth. (B) 3 months post operative radiograph shows sign of Apexogenesis. (C) Apexogenesis completed and no sign of pulp canal obliteration on 2 years follow-up. (D) Light cure composite was done for function reasoned.

After carefully checking that whole pulp was covered properly by 2 mm thick freshly prepared Bio dentin (Septodont, France) as per the manufacturer's guideline. Over the Bio dentin layer, a temporary restorative material placed as a double layer, and the patient was discharged for 24 hours. The patient was prescribed only Paracetamol as an SOS dosage.

After 24 hours of patients reported as asymptomatic, no pain or discomfort was reported. Temporary restoration then replaced with GIC (Fuji IX) under rubber dam isolation and again patient was discharged with oral prophylaxis instruction and mouth wash.

The patient was scheduled for an appointment as 7 days, 1 month, 3 months, 6 months, and 1-year interval. Check-up was done in 1, 3, 6, 12, 15, 24 months interval & radiographs showed signs of Apexogenesis with radiographically normal bone and dentin pattern. After 3 months Light cure restoration was done for a functional requirement. That tooth responded normally on Electrical Pulp Testing (EPT) as well as thermal testing (both cold & heat) on all the recall visits.

Discussion

Dental caries and traumatic injury are the most common threat of developing teeth. Both can cause the dental pulp to experience irreversible damage, causing necrosis of the pulpal tissues that can consequence in the arrest of regular root development [21]. Nonstandard root development may have an impact on the long-standing prognosis for tooth retention [22-25]. The most important objective of all restorative treatment in such cases is to maintain pulp vitality so that regular root development or Apexogenesis be able to take place. If pulp exposure occurs, either by caries or trauma then a pulpotomy practice aims to safeguard pulp vitality to allocate for normal root development [21]. A pulpotomy is a vital pulp therapy in which a part of the coronal infected pulp tissue is removed surgically, and the enduring healthy radicular pulp tissue is enclosed with an appropriate substance that protects the remaining healthy pulp from supplementary injury and permits and promotes healing [26].

Though a number of materials have been tried to induce dentine bridge formation via the dentinogenic potential of pulpal stem cells [27], Stanley (1989) strongly advocated CH for vital pulp therapy, and the CH has been used for the protection of exposed dental pulps up to the present time [28]. Several case series have suggested pulpotomy as a practicable treatment option for pulp exposures with pulpitis; the foundation being the healing prospective of the remaining healthy radicular tissue and the biocompatibility of pulpotomy materials, especially mineral trioxide aggregate [29]. So, it is very important to develop a biocompatible treatment option directed at maintaining pulp vitality and increasing tooth longevity [20].

Choukroun et al. (2006) first described PRF that has also been referred to as a second-generation platelet con cent

rate, which has several advantages over traditionally prepared platelet-rich plasma. In many advantages, the chief advantage is, it is strictly autologous. PRF matrix contains a large number of platelets and leucocyte cytokines [31]. Growth factors (GF) like TGF- β , Bone Morphogenetic Proteins (BMP) play a key role in signalling the events of tissue formation, repair, and regeneration in the dentine-pulp complex. After a dental injury during the time of tissue regeneration GF plays the key role of morphogenesis and differentiation [32].

In the current case, slow polymerization potential of PRF and the growth factors play a great role to repair and regenerate the pulp dentin complex. As the PRF is strictly autologous, the PRF was prepared from the patient's own blood and was placed in the pulp chamber over healthy pulp tissue. Bio dentin was chosen over MTA because of better working handling property and cause less discoloration of PRF than MTA. Another cause for choosing Bio dentin that Bio dentin has superior sealing ability than MTA [33]. As the initial setting time of Bio dentin (6 min) is very less a layer of GIC (Fuji IX, Japan) was placed after 10 min, thus a double seal layer was created to prevent microleakage. Follow-up radiographs revealed root formation had taken place and a thickening of the root dentin walls was noted. At a 6-month recall visit, the bevel-shaped ends of the dentin at 3 months appeared to change to thicker round-shaped root-dentin walls, and finally on 12 months visit the apex was completely closed, full Apexogenesis occurred. On long term follow-up pulp canal obliteration was not noted.

Conclusion

Apexogenesis with the help of PRF was successful in an immature premolar with pulpitis and severe tooth structure loss. In this case, that tooth treated with REP

responded to Apexogenesis without any pulp canal obliteration.

It can be concluded that pulpotomy with the help of PRF can be an alternative treatment option in Apexogenesis in mature permanent teeth with pulpitis. Further studies (histological and clinical) can put an important influence on this treatment option.

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