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Regenerative endodontic therapy on a traumatized immature maxillary central incisor with periapical lesion using platelet rich fibrin– An eighteen month follow UP

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Abstract

Teeth with incomplete root development have short roots with thin walls, which compromises their longevity. Through regenerative therapy, we can facilitate root development in previously immature teeth with necrotic pulps. This is a significant benefit over conventional root canal treatment and especially valuable for young patients, as teeth preservation is critical to their skeletal and dental development. Regenerative therapy may be considered because the stem cells present inside the canal and Apical papilla stem cells may help in the closure of the open apex by differentiating into cells required for root formation.

This case report describes a 14-year-old female patient with an immature non-vital Right Maxillary Central Incisor with a grade I mobility and apical pathology, which was treated via revascularization using 1.5% NaOCl and 17% ethylene diamine tetraacetic acid as irrigants; triple antibiotic paste as intracanal medicament and platelet-rich fibrin (PRF) as the scaffold. After 3-months, the clinical examination revealed a reduction in mobility to physiologic level, negative responses to percussion, and palpation tests. 6-month, 1-year, and 1.5-year radiographic examination revealed regression of the periapical lesion and increased root wall thickness.

Based on the follow-up of this case report, it can be concluded that regenerative endodontic therapy using PRF can be a viable treatment option for necrotic infected immature teeth.

Keywords: revascularization, regenerative endodontic procedures, platelet-rich fibrin

Introduction

The management of immature permanent teeth with pulpal necrosis is challenging as the root canal system is often difficult to debride and the thin dentinal walls are at an increased risk of a subsequent cervical fracture [1]. Regenerative endodontic therapy provides an alternative treatment approach that builds on the principles of regenerative medicine and tissue engineering. The therapy aims to successfully treat these challenging cases by regenerating functional pulpal tissue utilizing protocols referred to as regenerative endodontic procedures (REPs) [2]. Three important principles of regenerative endodontic procedures are Elimination of bacteria from the canal system, Creation of a scaffold for the ingrowth of new tissue, Prevention of reinfection by creating a bacteria-tight seal [3].

Case Report

A 14-year-old female patient was referred with a chief complaint of fractured Right Maxillary Central Incisor. The patient had a history of trauma 6 years before. The medical history of the patient revealed no systemic disease. Intraoral examination revealed an oblique fracture of the maxillary right Central incisor involving both enamel and dentin. (Figure 1) Tooth exhibited grade I mobility and was tender on percussion. There was no response to the cold test or electric pulp test. Further radiographic examination of the tooth revealed a wide-open apex along with thin dentinal walls that appeared prone to fracture associated with periapical radiolucency. (Figure 2)

Pulp necrosis with Symptomatic apical periodontitis was the diagnosis. Treatment options were

Apexification and Regenerative endodontic treatment. A clinical decision of performing Regenerative endodontic treatment was made as successful regeneration of the pulp-dentin complex would likely result in vital tissue capable of mounting an immune response and signaling tissue damage by sensory neurons. Written informed consent was obtained from the patient.

After administration of 2% lignocaine without vasoconstrictor and rubber dam application, access opening and working length determination were done. (Figure 3) The pulp chamber and root canal were mildly irrigated with 20 mL of 1.5% NaOCl without any mechanical instrumentation and then irrigated with 17 % EDTA (20 mL, 5 min), with irrigating needle positioned about 1 mm from the root end. The canal was then dried using sterile paper points. The pulp chamber was sealed with dentin bonding agent. Inter-appointment medication of triple antibiotic paste comprising a mixture of Ciprofloxacin (Cifran 500mg, Ranbaxy Lab, India), Metronidazole (Metrogyl 400mg, J.B. Chemicals and Pharmaceuticals, India), and Minocycline paste (Minoz 50 mg, Ranbaxy Lab, India. (1:1:1)) was prepared into a creamy consistency and introduced into the canal using a lentulospiral. A cotton pellet was placed and the cavity was temporarily sealed with cavit. The patient recalled after 3 weeks and the tooth was re-accessed. Anesthesia with 2 % lignocaine without vasoconstrictor, dental dam isolation was

done. Copious, gentle irrigation with 20ml of 17% EDTA and the canal was dried using sterile paper points. A volume of 5mL of the patient's blood was drawn from the patient's cubital vein collected in a glass test tube and centrifuged under 3000 rpm for 10 minutes in a centrifuge machine (REMI) to obtain the PRF. In the test tube, PRF was the middle layer with acellular plasma at the top and red blood cell (RBC) at the bottom. (Figure 4) Using sterile tweezers, the fibrin clot was removed and squeezed between 2 gauze pieces to drive out the fluids trapped in the fibrin matrix, and an autologous strong fibrin membrane was obtained. (Figure 5) The freshly processed PRF membrane was then placed into the canal opening then pushed below the level of cementoenamel junction (CEJ) using finger and hand pluggers such that it reached the apical end.3 mm of biodentine was placed over the PRF followed by placement of GIC as a permanent restoration. (Figure 6)

After 3-months, the clinical examination revealed a reduction in mobility to physiologic level, negative responses to percussion, and palpation tests. The 6- month follow-up showed an absence of signs and symptoms. (Figure 7) The 12- month follow-up showed satisfactory resolution of periapical lesion.(Figure 8) The 18-month follow-up showed increased root wall thickness. (Figure 9)

Fig 1

Fig 2

Fig 3

Fig 4

Fig 5

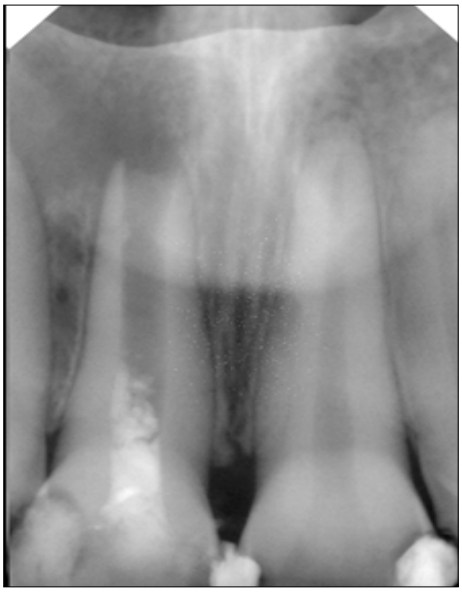

Fig 6

Fig 7

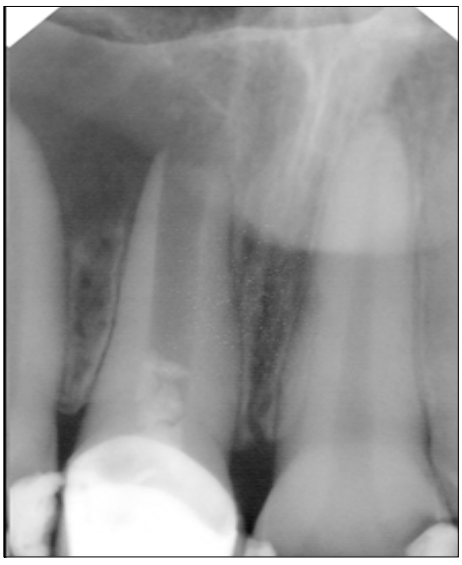

Fig 8

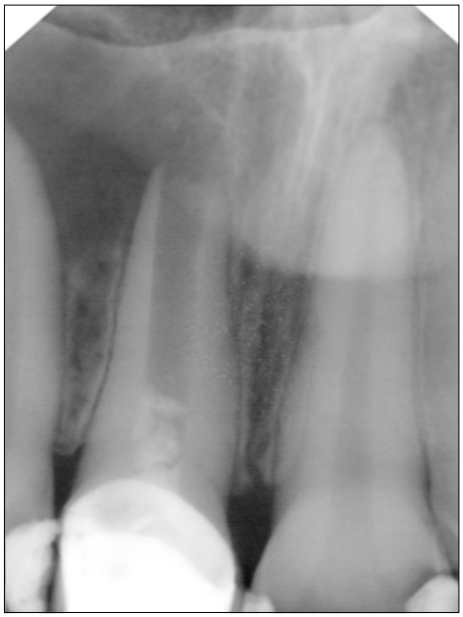

Fig 9

Discussion

Regenerative endodontic procedures are defined as biologically based procedures designed to replace damaged structures, including dentin and root structures, as well as cells of the pulp-dentin complex [4]. PRF is a fibrin mould where platelet cytokines and cells are wedged. They serve as a resorbable membrane following their release after a certain time Also, the mechanical properties of PRF might aid in the condensation of overlying biodentine which makes it an optimal bioscaffold for revitalization [5].

The degree of success of Regenerative Endodontic Procedures is largely measured by the extent to which it is possible to attain primary, secondary, and tertiary goals:

- Primary goal: The elimination of symptoms and the evidence of bony healing.
- Secondary goal: Increased root wall thickness and/or increased root length (desirable, but perhaps not essential)
- Tertiary goal: Positive response to vitality testing (which if achieved, could indicate a more organized vital pulp tissue) [6]

In addition to the resolution of clinical signs and symptoms and periapical healing, regenerative endodontic procedures have shown approximately 15% increase in root length and a 29% increase in root width that was very significant compared to apexification procedures. This substantial increase in root development is a crucial benefit as it may have a positive effect on the longevity of the immature tooth. These advantages are unparalleled with any other endodontic treatment [7].

In this case, there was a reduction in mobility to physiologic level, negative responses to percussion, and palpation tests, regression of the periapical lesion, and increased root wall thickness suggestive of successful accomplishment of primary and secondary goals of regenerative endodontic procedure. Further reviews are yet to be carried out.

Conclusion

Regenerative endodontic procedures hold the promise of restoring the pulp/dentin complex in teeth with immature roots and necrotic pulps. They have the potential advantages

versus traditional treatment procedures of increasing root wall thickness and root length.

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