Challenges In Regenerative Endodontics: A Case Report

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Abstract

Regenerative endodontics is a part of the advanced endodontic procedure for the well being of immature teeth with root canals that are infected and it can be called as "paradigm shift" in the ideal approach of treatment for continued root maturation and apical closure. It is a procedure which is clinically oriented to disinfect the root canal system without damaging stem cell present in the apical papilla and dentinal wall. By instrumentation process bleeding induced in the apical area to induced new stem cells in this area followed by intracanal cement placement to prevent microleakage. The mechanism of REP was to make triad by biomarkers, stem cells, Scaffold which works on the regeneration of lost tissue of pulp dentine complex and further root formation. Many authors suggested that the REPS procedure is the definitive treatment of immature teeth with pulp necrosis.

For a dentist it is a unique challenge to treat an immature tooth with apical periodontitis and pulpal necrosis. For endodontic treatment the options available are apexification, apical barriers and revascularization of the permanent tooth. 16 years old boy comes to a comprehensive college clinic with the complaint of pain and swelling in the lower posterior tooth region. On clinical examination lower premolar with apical periodontitis was treated with revascularization protocol irrigating with normal saline and sodium hypochlorite, an antibiotic paste (triple), mineral trioxide aggregate and then a coronal seal with a dental composite. In a follow up of one year there was an evident resolution of radiolucencies in the periapical area and root development was appreciated.

Keywords: *Revascularization; Immature tooth; Antibiotic paste*

Introduction

In the year 1960, Dr. Ostby first proposed the theory of regenerative endodontic procedure. The theory says that the vitality of the pulp is directly dependant on the presence of blood clots in the canal which helps in promoting healing of the pulp.[1] The process was similar to other parts of the body like blood clots help the injury site to repair itself.

Authors suggested that REPS can be performed in infected immature permanent tooth because in a clinical trial and histological examination they found mesenchymal stem cells on apical end of the root.[2-4] These stem cells have the ability to differentiate into odontoblastic cells that helps in forming root dentin and these cells are called SCAP (stem cells of apical papilla) and other cells present in pulp are called dental pulp stem cells (DPSCs).[3] They both can form dentin pulp complex. Both cells are potent to differentiate as mesenchymal cells from the bone. The difference between in these cells like, SCAP showed a greater proliferation of the cell, number of population doubling and tissue regeneration as compared to DPSCs.[4]

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Factor affecting the revascularization is related to infection in the root canal. It is difficult to treat infected canals with the REPS technique. In these types of cases triple antibiotic paste or CaOH paste are used to disinfect the canal. The second important factor was the size of apex during REPS is more than 1.1 mm apical diameter then revascularization increases in about 18 - 34% of teeth with immature root development. The 3rd factor is age which is considered between 8 to 16 years which is more considerable to the REPS procedure. REPS procedure should be avoided in the deciduous tooth as there is potent risk of impairing the eruption of permanent dentition.[5,6]

Regenerative endodontics procedure (REP) is the biological procedure in which damaged tissue can be replaced by newly formed cells (Dentin and root structure). REP is part of tissue engineering, which was adopted by the American Dental Association in the year 2011. Root canal is the definitive treatment in the case of pulpities or apical periodontitis patients.[7] The RCT procedure involves the complete removal of pulp tissue by biomechanical preparation, so that the bacterial and toxin load will reduce in canal in adult patients.[8] In children absence of apical constriction can be seen which can lead to RCT procedure problematic. For these types of case, apexification can be the best option, but there are some disadvantages like treatment time, compliance of the patient, risk of fracture of bone associated with tooth.[9]

So, recent advancement in endodontics, for the treatment of immature tooth regenerative endodontics procedure is used. REP is a biological replacement of dental tissue and makes the tissue in a functional state. MTA was the material of choice.

Case Report: A 16-year-old male patient reported to the dental clinic with the chief complaint of pain accompanied by swelling in the lower back tooth region. The patient has no previous medical and dental history. On clinical and radiography examination large carious lesion found in tooth number 34. On intraoral soft tissue examination reddish-pink gingival, soft and edematous with rolled out margin, no periodontal pocket was appreciated, on palpation was mildly painful with sinus tract. On radiography examination (Figure 1) secondary caries under the restoration and radiolucency and widening of Lamina dura were present on the apical area of the root. The final diagnosis tabulated was chronic apical periodontitis after clinical and radiographical considerations. Thereafter informed consent was taken from the patient and treatment was initiated.

Figure 1: Showing a carious lesion in lower left second premolar

Local anesthesia 2% Lignocaine with epinephrine, was administered isolation was done by rubber dam. Access cavity was performed, bleeding and purulent exudates were seen in the canal. Proper irrigation protocol was followed by 5.25% Sodium Hypochlorite, 20 ml of normal saline followed by 10 ml of 2% Chlorhexidine.

The canals were dried, and a triple antibiotic paste consisting of ciprofloxacin, metronidazole, and minocycline (100 mg of each drug in a 0.5-mL total volume) was placed. After three weeks the patient was symptomless. Local anesthesia without epinephrine was administered and then removal of triple antibiotic paste was done. Bleeding was induced by hand file in the canal, bleeding was controlled and then MTA was placed over the clot.

Figure 2: A radiograph showing placement of MTA and completion of composite restoration on tooth.

Figure 3. Healing of the radiolucent lesion, 1 year follow up.

On one year follow-up during clinical examination patient was asymptomatic, no bleeding, no swelling and no sinus tract was detected. Radiographically there was no visible lesion appreciated.

Discussion

Regenerative endodontic procedures also known as REPS is defined as a procedure that is biologically designed to replace damaged structures dentin, root structure and cells of the pulp-dentin complex.[9] It is a new modality to help the normal function of the pulp. It has become an alternative method to heal apical periodontitis. REP is an extension of root canal therapy with specially designed method. In conventional treatment the dentist cleans the root canal and fills the pulp chamber with inert material after cleaning the root canal.[10] As compared to conventional root canal, REPS replaces the live tissue cells in pulp tissue. The main goal of REPS is to regenerate tissue present in the pulp and modify the function of the pulp dentin complex. [6]

Before the introduction of REPS apexification procedure was used in the treatment of immature permanent teeth with the use of mineral trioxide aggregate and long term use of calcium hydroxide.[11] This treatment cannot resolve complete signs and symptoms of pathology. They affect the root development procedure. One of the options for the treatment of immature teeth with open apex can be Regenerative endodontics procedure (REP) because it has a great ability to affect the size of root length ratio and thickness of root wall by biomechanical process.[12-14] Apical bleeding initiated by the hand file in the root canal, making a feasible environment for pulp regeneration with host endogenous stem cells and growth factor in a bioactive scaffold.[15]

A study done in the year 2002, showed that the use of CHX as irrigation material caused detrimental effects on stem cells. The role of triple antibiotic paste has reduced the bacterial and toxin load in the canal. Many recent research articles show that inclusion of blood clot in the canal space help in revascularization and bleeding produces predominant mesenchymal stem cells which can form dentine complex.[16] The placement of MTA helps in making the apical barrier so that bacteria cannot enter through apical constriction. Many researcher suggest that use of $Ca(OH)_2$ in the tooth before placement of MTA as $Ca(OH)_2$ make the clot settle in the canal and prevent the movement of MTA, the coronal end 2-3 mm apical to cement enamel junction after which Glass ionomer material is placed over the MTA.[17]

Conflict of Interest: Nil

Funding: None

Ethical Permission: Approved

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