

## CASE REPORT

### REGENERATION IN PERMANENT IMMATURE NECROTIC TOOTH –A CASE REPORT

Snigdha Shubham<sup>1,\*</sup>, Manisha Nepal<sup>1</sup>

<sup>1</sup>Department of Conservative Dentistry and Endodontics, Universal College of Medical Sciences, Bhairahawa, Nepal.

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**\*Correspondence to:** Snigdha Shubham, Department of Conservative Dentistry and Endodontics, Universal College of Medical Sciences, Bhairahawa, Nepal.  
Email: [drsnigdhashubham15@gmail.com](mailto:drsnigdhashubham15@gmail.com)

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#### ABSTRACT

Immature necrotic teeth pose a challenge to endodontist. To simplify this challenge regenerative endodontic has gained popularity these days. This approach is based on triggering stem cells and repopulate over scaffold to induce regeneration of pulp like tissue. This case report presents a case of regeneration of apical tissue with significant healing of periapical lesion.



#### INTRODUCTION

From a biologic perspective, the goal of endodontics is to prevent or treat apical periodontitis. An optimal way to accomplish this goal is to either maintain pulpal health in cases of pulpal inflammation or to regenerate healthy pulpal tissue in cases of pulpal necrosis. Thus, there is considerable interest in research and clinical studies aimed towards regeneration of a functional and healthy pulp-dentin complex.<sup>1</sup>

Regenerative endodontics is a treatment modality that induces formation of a dental pulp-like tissue that will act as the original dental pulp.<sup>2</sup> Regenerative endodontics uses several types of osteo/odonto progenitor stem cells in apical papilla which over the scaffold under the action of growth factor forms pulp-like tissue. These stem cells in the apical papilla are resistant to the infection and necrosis due to proximity to periodontal blood supply.<sup>1</sup> In this treatment, the root canal space is disinfected, scaffold is created for repopulation of stem cells and hermetic coronal seal is done. This treatment promotes the regeneration of pulp-like tissue which induces apex closure and healing of apical pathology.<sup>3</sup>

#### CASE REPORT

A 16 years old male patient reported to the Department of Conservative and Endodontics, Universal College of Medical Sciences, Bhairahawa, Nepal with the chief complain of pain and swelling in upper front region of the jaw. Pain was mild to moderate in intensity, dull and continuous in nature. On examination, the tooth was discolored and was tender on percussion. Sinus opening was present on the labial mucosa in relation to 11 as shown in Figure 1A.



**Figure 1A: Preoperative Clinical Photograph**

Sensibility tests were done which revealed the tooth had no response. On radiographic examination, it revealed periapical radiolucency of about approximately 3 x 4 cm size. The radiolucency had indistinct margin and was continuous with apical

foramen which was open as shown in Figure 1B.



**Figure 1B: Preoperative Intraoral Radiograph**

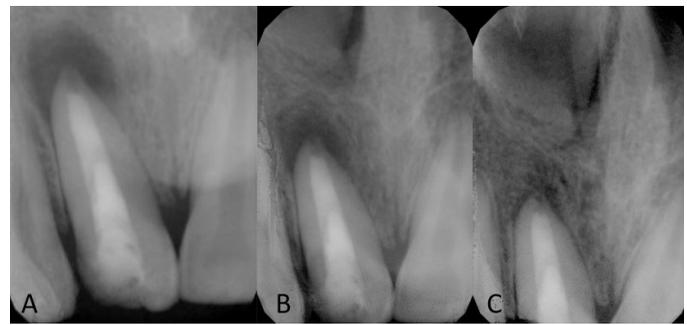
Diagnosis of Chronic apical abscess in relation to 11 was made. Endodontic treatment followed by revascularization was planned for this case.

Reasons for revascularization were a) Patient was young - greater healing capacity or stem cell regenerative potential<sup>4</sup> and Open apex –foster ingrowth of tissue into root canal space and indicates rich source of mesenchymal stem cells.<sup>3</sup>

Access opening was done with the help of endo-access bur (Dentsply Maillefer, Switzerland). Working length was taken and minimal preparation was done with #30K files (Dentsply Maillefer, Switzerland). Copious irrigation was done with 20 ml of 1.5% Sodium hypochlorite (Pyrax, India), normal saline (Axa Parenteral Ltd, India) and 17% Ethylenediaminetetraacetic acid (Ammdent, India). Root canal system was dried with sterile paper points and Triple Antibiotic Paste (TAP) was delivered into the canal with help of lentulospiral. After 2 weeks there was no swelling and patient was asymptomatic. The canal was copiously irrigated with 1.5% NaOCl (Sodium Hypochlorite), normal saline and 17% EDTA (Ethylenediaminetetraacetic acid). The canal was dried with sterile paper points and #25K file was placed beyond the apical foramen and apical tissue was lacerated to induce fresh bleeding. The bleeding could not be appreciated below the cemento enamel junction it was only upto apical 3-4 mm hence Mineral Trioxide Aggregate (MTA Angelus<sup>8</sup>, Brazil) was placed into the canal leaving apical 3-4 mm as shown in Figure 2.



**Figure 2: Intraoral Radiograph of MTA plug**



**Figure 3: Intraoral Radiograph of follow up A. 6 months, B. 8 months and C. 12 months**

The coronal seal was obtained with GIC (Fuji IX, GC America) and Composite resin (3M ESPE, USA). The patient was subsequently recalled after 6, 8 and 12 months for assessment of primary, secondary and tertiary goals. The patient was asymptomatic with satisfactory periapical healing accomplishing primary goal as shown in Figure 3A, 3B and 3C. The secondary goal was also achieved with closure of apex as shown in Figure 3C whereas tertiary goal of regaining pulp vitality was not achieved.

## DISCUSSION

Revascularization techniques which is based on tissue engineering concept is topic of research over last few decades. In tissue-engineering, stem cells/growth factors/scaffolds are employed directly whereas in revascularization, bleeding is triggered into an empty root canal space which will induce a process similar to wound healing by blood clot. Histologic evidence of an ingrowth of vascularized fibrous connective tissue was observed in 80% (28 of 35) of teeth with vital pulps but only 8% (1 of 12) of teeth with necrotic pulps.<sup>5</sup> According to Franklin Gracia et al when the apical foramen is > 1.1 mm natural revascularization occurs approximately 18-34%.<sup>6</sup>

Complete disinfection of root canal in regenerative endodontic treatments is a challenge because almost sterile environment is required for pulp regeneration. In addition, the technique also involves minimal or no instrumentation so we rely on copious irrigation for maximum antimicrobial and tissue dissolution effect. Hence, the canal was irrigated with 20 ml of 1.5% of NaOCl which is considered to be ideal concentration for sterilization of canal as well as least toxic to stem cells.<sup>7</sup> For final rinse, 17% EDTA was used as it has shown to promote the release of growth factors embedded in dentine that participate in both the regenerative processes as well as stem cell proliferation, migration, and differentiation.<sup>8</sup>

Bacterial cells are smaller in diameter compared with the pulpal end of dentinal tubules and therefore can penetrate deep into the dentinal tubules of infected teeth.<sup>9</sup> Moreover, in the younger teeth bacteria penetrate through more dentinal tubules and advance deeper in comparison with older ones.<sup>10</sup> Although NaOCl is an effective irrigant to reduce bacterial loads, it cannot render the infected root canal space bacteria free<sup>11</sup> hence, TAP was placed as an intracanal medicament. Two in

vitro studies by Hoshino et. al and Sato et. al revealed that the mixture of Ciprofloxacin, Metronidazole, and Minocycline was effective against endodontic pathogens and was able to deeply disinfect the infected dentinal tubules.<sup>12</sup> Moreover the concentration of 0.1mg/ml of TAP was considered to sufficient to eliminate bacteria from infected dentin with no detrimental effect on the survival of stem cells.<sup>13</sup>

Mineral trioxide aggregate was used as it is the most popular material for coronal plugs in revitalization procedures because of its biocompatibility, sealing ability and marginal adaptation; in fact, more than 85% of studies used MTA for this purpose.<sup>14</sup> Despite of these speculative procedure, present case could not regain vitality of pulp as it is obtained only in approximately 50% of the reported cases.<sup>1</sup> The primary and secondary goals

were achieved successfully.

## CONCLUSION

Regenerative endodontics is a field of active research that is dynamically growing in both basic research and clinical applications. Future developments have potential to revolutionize the practice of endodontics, possibly saving many teeth that would otherwise have a poor to hopeless prognosis. Although current case reports focus on applying these methods to the immature teeth with a necrotic pulp, it will be particularly interesting to apply the best lessons learned to the future application of regenerative endodontic procedures on the fully formed permanent tooth.

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