

**Management of an Immature Permanent Maxillary Central Incisor by Pulp Revascularization: A Case Report****Akhil Karickal Mohan, Viny Feba Yohannan, Jyothi Kashi Nanjundasetty, Venugopal Panuganti**

Department of Conservative Dentistry and Endodontics, Sri Siddhartha Dental College and Hospital, B.H. Road, Agalakote, Tumkur, Karnataka, India.

**Address for Correspondence:**

Dr. Shubhabrata Roy, Post Graduate Student, Department of Conservative Dentistry and Endodontics, Sri Siddhartha Dental College and Hospital, B.H. Road, Agalakote, Tumkur, Karnataka, India.

**ABSTRACT:**

**Introduction:** Management of immature, nonvital teeth is a challenging task for a practitioner owing to the difficulty in achieving a good apical seal. Traditional treatment options are apexification with calcium hydroxide, or single visit mineral trioxide aggregate plug. In recent years with advancements in tissue engineering techniques, pulp regeneration has reached new levels wherein increase in root length and root width are a reality with a potential for re-establishment of pulp vitality. Present case discusses the management of immature, open apex teeth with this novel technique.

**Case report:** A 19-year-old female, reported with discoloured 21. On clinical examination and radiographic examination, Tooth #21 showed asymptomatic periapical abscess with wide open immature apex and diffused periapical radiolucency in relation to 21. Various treatment options were explained and with patients consent, revascularization using PRF was performed. Esthetic requirements were met with composite veneer and satisfactory results were observed in one and a half year period. Further follow up is necessary to evaluate the continuation of root development.

**Conclusion:** Complete resolution of periapical lesion has been possible in this case with immature root which is the primary goal in revascularization procedure. The case presents a possibility of using PRF as an ideal biomaterial for pulp-dentin complex regeneration. Periodic follow up is necessary to see complete root formation and pulp vitality.

**Key Words:** Pulp revascularization, Immature tooth, Non vital tooth, Apexogenesis.**INTRODUCTION**

Major advancements in stem cell biology and tissue engineering in the last decade has propelled the growth of Regenerative medicine. Modern concept of medicine stresses on prevention and reversal of the diseases. For this, utilization of stem cells to regenerate the lost tissues is essential which thereby reverse tissues to their normal state. There lies the importance of regeneration after a dental trauma. Young children of age 6–16 have sequential permanent tooth eruption and maturation. Any factors that disturb this physiological process of pulp may alter completion of root development. Because of the important role of Hertwig's epithelial root sheath (HERS) in continued root development,

after pulpal injury, every effort should be made to maintain its viability.<sup>1</sup>

Clinical situations should be thoroughly analyzed before deciding upon the treatment modality because of the dramatic difference in their clinical outcomes. One is dealing with the immature teeth with vital pulp. A procedure that induces apexogenesis is undertaken to preserve the remaining vital tissue and to allow completion of root formation and apical maturation.<sup>2</sup> The other is the immature teeth with necrotic pulp. Apexification is usually the treatment option with either Calcium Hydroxide apexification or Mineral trioxide aggregate apexification.

Although calcium hydroxide apexification has proven to be highly predictable, it has the disadvantage of having multiple appointments

over a long period of time plus an increased susceptibility to cervical fracture.<sup>3,4</sup> MTA apexification technique is also predictable<sup>5,6</sup> and reduces the number of treatment appointments but they neither allow for thickening of the root wall nor continued development of the root which can be attained with pulp revascularization. Hence an attempt is made to manage the tooth using this novel technique.

### CASE REPORT

19-year-old female was referred from Department of Orthodontics for evaluation of discoloured upper front tooth 21 (Figure 1). The patient reported that she had a fall nearly 8 years prior. Pain was associated with the tooth after the injury but it eventually subsided. On radiographic examination (Figure 2), wide open immature apex with well defined radiolucency at root apex is seen in relation to 21. There was no response to any pulp sensitivity.



Figure 1: Pre-operative photograph showing discoloured 21.



Figure 2-Pre-operative radiograph showing a wide open immature apex with well defined radiolucency at root apex in relation to 21

We arrived at a provisional diagnosis of asymptomatic periapical abscess following which the treatment options like revascularization and MTA Apexification were recommended for the tooth followed by direct composite veneer.

**Procedure** - After obtaining informed consent, rubber dam isolation and access preparation were done. The canal was irrigated with 20 mL of 3% NaOCl, followed by 20 mL of saline. Working length was determined and Ca (OH)<sub>2</sub> dressing was given. Temporary stopping was given with Cavit and IRM. Antibiotics and analgesics prescribed. [Amox 500mg t.i.d and Divon plus t.i.d for 5days.]

Patient was recalled after 3 weeks and a draining sinus was noted accompanied by symptoms. Ca(OH)<sub>2</sub> dressing was given and antibiotics were prescribed. (Metranidazole 400mg tdi).

Patient revisited the clinic after 10 days and sinus had subsided. Saline irrigation was done, dressing with double antibiotic paste consisting of cipro floxacin 500mg, metronidazole 400mg (1:1) was placed. The teeth were then temporized.

The patient returned to the clinic 3 weeks later. The tooth was asymptomatic and the double antibiotic paste was removed, canal irrigated with 10 mL of 3% NaOCl. Using K file of size 80, attempts to induce bleeding was done but it was scanty. PRF was prepared with 3 ml of patient's own blood drawn from patient's antecubital vein and centrifuged at 3000 rpm for 12 mins using Process centrifuge (PC-02, Process Ltd., Nice, France) and placed in the canal.(Figure 3) After 15 minutes, white MTA (Dentsply Tulsa Dental, Tulsa, OK) was placed over it below the CEJ to avoid discoloration and a wet cotton pellet was placed and the tooth was temporized with zinc polycarboxylate cement.

At 3 months follow up period, the patient was asymptomatic with no signs of edema, erythema, or sinus tracts and radiograph revealed healing of the radiolucent lesion. (Figure 4) Temporary cement was replaced

using composite resin. At 6-months recall, the patient was asymptomatic with periapical healing with trabecular bone pattern with 1mm increase in root width. At 1 and a half year follow-up, slight response to cold test was observed with further resolution of periapical lesion.(Figure 5) Direct composite veneering was done for esthetic management of the tooth. (Figure 6)



Figure 3: Photograph showing PRF prepared from autologous blood.



Figure 4: showing 3 months follow up post operative radiograph

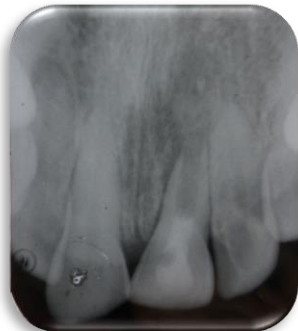


Figure 5: showing 1 1/2 years follow up post operative radiograph



Figure 6: Showing post operative photograph after direct composite veneering

## DISCUSSION

Treatment of immature teeth has now moved from mechanical to biologically based procedures. Even though tooth is non vital, some pulp tissue & Hertwigs epithelial root sheath might survive apically that can proliferate under favorable conditions to aid in the process of regeneration.<sup>7</sup>

The conventional method of revitalization procedure is done by inducing bleeding which stimulates the stem cells of apical papilla (SCAP) whose proliferative rate and survival are superior to dental pulp stem cells (DPSC). Research has shown that the inclusion of a blood clot in the canal space tended to improve the revascularization outcome.<sup>8</sup> Autologous fibrin matrix is considered as a 3 dimensional scaffold with more growth factors such as TGF  $\beta$ 1 and VEGF than blood clot.<sup>9</sup> PRF compensated for the scanty bleeding we obtained in this case. There was persistent draining sinus after 3 intracanal Ca (OH)<sub>2</sub> dressings. Hence double antibiotic paste with ciprofloxacin 500mg and metronidazole 400mg (1:1) was used. Minocycline was avoided as it is known to cause discolouration.<sup>10</sup> After 3 weeks, the teeth were asymptomatic proving its efficacy to disinfect the root canal.

During the follow up period, patient remained asymptomatic with remarkable periapical healing with 1mm increase in root width. Slight response to cold test was observed during 1 and a half year follow-up, which is an advantage over conventional methods where only the mechanical apex closure is achieved. However, revascularization still faces certain limitations. Case selection is difficult wherein tooth is nonvital, but maintains vital apical cells necessary for successful regeneration, but then it doesn't guarantee success always. Systemic health conditions and immunologic problems might create challenges in achieving adequate root maturation in immature teeth.<sup>11</sup> Recent AAE protocol advocates Biodentine or RMGIC as a capping material over blood clot

instead of MTA in esthetically important teeth<sup>12</sup>

## CONCLUSION

Any organ when vital will work more efficiently and revascularization is a sound biological approach. Primary goals of the therapy are achieved and it is observed that PRF is an ideal biomaterial for pulp-dentin complex regeneration. Periodic follow up is necessary to see for Secondary and Tertiary goals. Although there are still many hurdles to achieve complete regeneration, with the continued research and developments, the future of Regenerative Endodontics looks promising.

## REFERENCES

1. Rafter M. Apexification: a review. *Dent Traumatol* 2005;21:1–8.
2. Bishop BG, Woollard GW. Modern endodontic therapy for an incompletely developed tooth. *General Dentistry* 2002; 50:252–6.
3. 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.
4. Doyon GE, Dumsha T, von Fraunhofer JA. Fracture resistance of human root dentin exposed to intracanal calcium hydroxide. *J Endod* 2005;3:895–7
5. Holden DT, Schwartz SA, Kirkpatrick TC, et al. Clinical outcomes of artificial rootend barriers with mineral trioxide aggregate in teeth with immature apices. *J Endod* 2008; 34:812–7.
6. Witherspoon DE, Small JC, Regan JD, et al. Retrospective analysis of open apex teeth obturated with mineral trioxide aggregate. *J Endod* 2008;34:1171–6.
7. Trope M. Treatment of the immature tooth with a non-vital pulp and apical periodontitis. *Dent Clin North Am* 2010;54(2):313-24.
8. Thibodeau B, Teixeira F, Yamauchi M, et al. Pulp revascularization of immature dog teeth with apical periodontitis. *J Endod* 2007;33:680–9.
9. Anitua E, Sanchez M, Nurden AT, Nurden P, Orive G, Andía. New insights into and novel applications for platelet-rich fibrin therapies. *Trends Biotechnol* 2006;24(5):227-34.
10. Petrino JA, Boda KK, Shambarger S, Bowles WR, McClanahan SB. Challenges in regenerative endodontics: a case series. *J Endod* 2010;36(3):536–41.
11. Ambica K. Revascularization of Immature Permanent Tooth with Periapical Lesion using a New Biomaterial - A Case Report. *International Journal of Dental Sciences and Research* 2013;1(1):20-2.
12. Curriculum/Syllabus for Advanced Programs in Endodontics on Revascularization and Regenerative Therapy [www.aae.org] Copyright © 1995-2016 [updated 2016 April 25; cited 2016 May 7] Available from www.aae.org/uploadedfiles/publications\_and\_research/research/currentregenerativeendodonticconsiderations.

**How to cite this article:** Mohan AK, Yohannan VF, Nanjundasetty JK, Panuganti V. Management of an Immature Permanent Maxillary Central Incisor by Pulp Revascularization: A Case Report. *Arch of Dent and Med Res* 2016;2(3):98-101.