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Case Series

Revascularization of immature permanent teeth with peri-apical lesions- A case series

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ABSTRACT

When immature permanent teeth become non-vital, the prognosis of the teeth is compromised. Disinfection and obturation of root canals with open apices can be challenging. Revascularization is a useful tool for the treatment of permanent teeth with necrosed pulp and open apex. Clinically, Revascularization procedures consist of disinfection by intra-canal medicaments followed by inducing blood clot in the root canal or implantation of autologous fibrin matrices like PRP/PRF. Such procedures may improve prognosis of necrosed teeth with open apices. Existing studies indicate that regenerative procedures lead to increase in length and wall thickness of radicular dentin. This article presents a case series of three cases where revascularization procedures were successfully carried out.

1. Introduction

By Definition Regenerative Endodontics includes biologically based procedures designed to replace damaged structures including dentin of root structures and cells of the pulp-dentin complex.[1] Nygaard Ostby in 1961, stated that blood clot formation in empty root canal can support neovascularization and new tissue growth.[2] This research forms basis for regenerative endodontic procedures.

Permanent dentition with necrotic pulps and open immature apices are suitable candidates for such treatment modalities.[3] Regenerative Endodontics is based on concepts of Tissue Engineering that requires dynamic interactions between stem cells, morphogens and scaffolds all in proper spatial assembly to form functional pulpodentin complex.[4]

Clinically such treatment protocols consists of the first phase of utilizing medicaments for disinfection followed by the next phase of treatment that includes induction of blood clot or implantation of autologous PRP/PRF inside the root canal.[5] Thereafter patient is recalled periodically for follow up.

Revascularization procedure has been useful in treatment of teeth with necrosed pulp and immature apices, it attempts to preserve the remaining pulpal stem cells and the mesenchymal stem cells of the apical papilla which may lead to revascularization and completion of root maturation.[6] The cells with proliferative potential normally remain in a dormant state, their activation may be brought about by micro-environmental alterations such as disease or injury.[7]

In cases of symptomatic/asymptomatic apical periodontitis, even if the lumen of the root canal is lacking vital tissues. However, traces of viable pulpal tissue may survive in the apical region inspite of presence of a large periradicular lesion.[8]

Pulp revascularization is a promising approach these days for treatment of pulpless immature permanent dentition. Existing Clinical literature has shown that regenerative endodontic procedures can cause significant

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increase in length and thickness of dentinal walls.

This present article presents a case series of three successful cases of Regenerative Endodontic procedures.

2. Case Report 1

A 19 year old female patient was referred to the Department of Conservative Dentistry & Endodontics, Seema Dental College and Hospital , Rishikesh with a chief complaint of unesthetic appearance and occasional pus discharge from the gums in the upper front teeth. The patient recalled a history of trauma to anterior upper teeth ten years earlier. Clinical examination revealed mutilated and fractured crowns with 11, 12, 21. Tooth no. 22 was missing. On pulp testing, teeth # 11, 12, 21 were found non-vital. A radiographic examination revealed an immature root of tooth #12 with a radiolucent periapical lesion. [Figure 1] The diagnosis of necrotic pulp with asymptomatic apical periodontitis was made with 11, 12, 21. The treatment plan followed for 11 & 12 was conventional Endodontics as their roots were fully matured. The treatment plan formulated for 12 was regenerative endodontics. After local anesthetic administration, an access cavity was prepared in 11, 12, 21. The working length was determined. The canals of 11, 21 were prepared till the master apical file # 50 and temporized using Calcium hydroxide as intracanal medicament. Tooth no. 12 was irrigated using a copious amount of 3% sodium hypochlorite (NaOCl) and gently filed using the #80 file. Triple antibiotic paste was introduced in the canal as an intracanal medicament for two weeks and temporized using cavit. On subsequent visit, the patient was found to be asymptomatic therefore 11 and 21 were obturated using the lateral condensation technique. Tooth no. 12 was re-opened and flushed copiously with 3% NaOCl irrigating solution and intracanal medicament was gently removed. Canal was then dried and bleeding was induced using a sterile # 50 hand file by inserting it 1mm beyond the apical constriction allowing the canal to fill up with blood, pressure was applied in the pulp chamber for 5-7 min to facilitate clot formation over which Mineral Tri Oxide (MTA) was placed and covered with moist cotton pellet to aloow setting. The patient was asked to return in two days to ensure MTA was set following which a permanent restoration was done with composite.[Figure 2] tooth no. 21 was restored using a pre-fabricated post and composite core followed by prosthesis. Baseline and subsequent 12 months and 24 months of follow-up radiographs were taken.[Figures 3 and 4] The patient was clinically asymptomatic with complete gradual resolution of Periapical lesion. Apical closure was visible on radiograph. Later 11& 12 were also restored with PFM prosthesis.

3. Case Report 2

A 16 years old female patient reported to the Department of Conservative & Endodontics, Seema Dental College, Rishikesh with chief complaints of pus discharge and swelling in the palatal region of upper anterior teeth. The patient recalled a history of trauma to the upper anterior region eight years earlier. Clinical examination revealed discolored 11. Palatal swelling was fluctuant. On pulp testing, 11 was found non-vital. There was a wide gap between 12 & 13. Radiographic examination revealed an immature open root apex with thin dentinal walls associated with very large periapical pathology. [Figure 5] Based on clinical, pulp testing, and radiographic findings, a diagnosis of pulp necrosis with a symptomatic apical abscess with 11 was established. Taking into consideration the wide open apex, revascularisation was preferred as a treatment option. The treatment was explained to the patient and her parents. After local anesthetic administration, an access cavity was prepared in 11. The working length was determined. The tooth was irrigated using a copious amount of 3% NaOCl and gently filed using #80 file. The triple antibiotic paste was placed as an intra-canal medicament for two weeks. The tooth was temporized using cavit. On the next visit, the patient was asymptomatic with complete resolution of palatal swelling. The access cavity was opened and a revascularization procedure was done in 11 i.e. bleeding was induced and clot formation was allowed in the cervical third of the canal. MTA was placed over the clot. The patient was recalled after two days and permanent restoration using composite resin was done. 12 months follow-up radiographs were taken. [Figure 6]

The patient also underwent orthodontic treatment simultaneously. On follow-up visits, the patient was asymptomatic. Periapical healing was evident radiographically. The narrowing of the canal was evident radiographically.

4. Case Report 3

A 15 years old male reported with chief complaints of pain and swelling in the upper anterior region. The patient had a history of fall nine years back and using a safety pin to dig into his tooth and getting it broken there. On clinical examination, the swelling was evident in the upper anteriors. Teeth no. 21 and 22 were cariously exposed. 21 was discolored. Radiographically, the broken pin was evident with the pin extruding into the periapical region. [Figure 7] A large periapical lesion was also present involving 21 and 22. Both were found non-vital on pulp testing. Based on detailed history, examination and investigations diagnosis of necrotic pulp with apical abscess with 21 and 22 was established. Taking into consideration, the wide open apex of 21 revascularisation for 21 and conventional endodontic treatment for 22 were planned and informed consent

wasobtained.

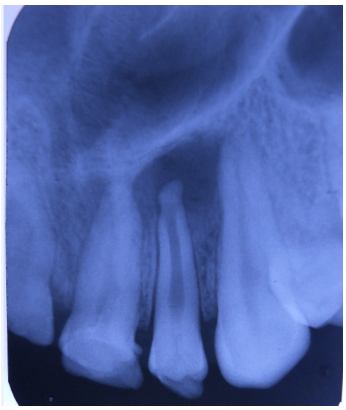

Figure 1: Pre-operative

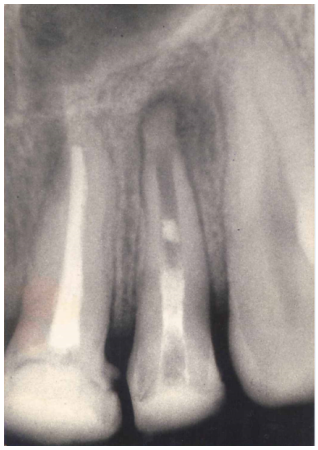

Figure 2: Post-operative

Figure 3: After 1 year

After LA administration, access cavities were prepared in 21 and 22. Using # 70 H-file, the broken pin was removed

Figure 4: After 2 years

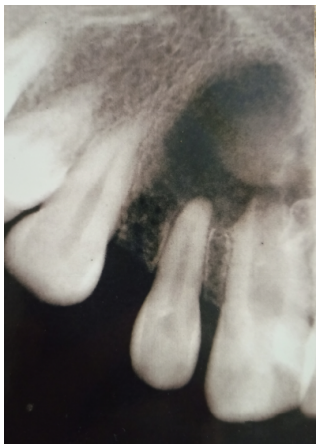

Figure 5: Pre- operative

Figure 6: One year post- operative

Figure 7: Pre-Operative

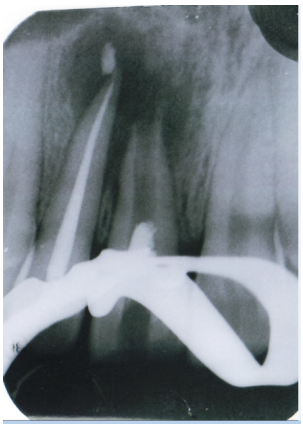

Figure 8: Placement of MTA

Figure 9: One year post- operative

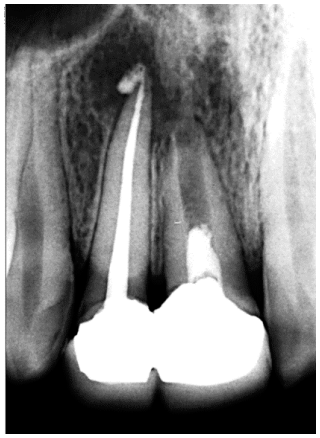

Figure 10: 2 years post- operative

from tooth 21. 22 was prepared till no. 50 MAF. The tri-antibiotic paste was used as intra- canal medicament and both teeth were temporized using cavit and recalled after 7 days. On the next visit, endodontic treatment was completed with 22. The tri-antibiotic paste was repeated in 21 for another week. After one week, the revascularization process was done in the same way as in the above two cases.[Figure 8] Follow-up radiographs were taken at 12 months and 24 months. [Figures 9 and 10] Patient was clinically asymptomatic. Radiograph showed evidence of periapical healing.

5. Discussion

Revascularization of pulp is a novel treatment modality which relies on the differentiation potential of residual pulp and stem cells of the periodontium into specialised cells.[9] The basic requisite of revascularization procedure for non vital infected and immature teeth is disinfection, scaffold(blood clot)and good coronal seal.[10] Two techniques have been seen in the existing literature, one that uses calcium hydroxide and the other using triple antibiotic paste.With advancement in Endodontic irrigation and disinfection protocols there are various technologies available to clinicians which can achieve adequate disinfection of the root canals for revascularization procedure to show successful results. In all the three cases in this report, Triple antibiotic paste was used as intracanal dressing for 2 weeks and NaOCl was the irrigation of choice under rubber dam isolation.The antibacterial efficacy and therapeutic success of triple antibiotic paste has been well established in studies by Hoshino et al[11] confirmed by windley et al[12] and many others. This step of disinfection is followed by inducing a blood clot into the canal by overinstrumentation. This blood clot is filled upto CEJ level and it act as a scaffold that may provides environment for differentiation of stem cells which may stimulate apical development and maturation of root in such necrotic pulp

and immature apex cases.[13–15] It is unclear to date that regenerated tissue bears resemblance to pulp, however the published data reveals continuation of root closure.[16] Young adults have higher healing capacity than older individuals.[17] Cases presented here are patients of young age group. All our cases were young suggesting the increased regenerative potential of stem cells. A case report has been published that used platelet-rich plasma for the revascularization process in an open apex and infected root canal case. The blood clot approach is simpler and does not require any expensive technology. It can be accomplished using medicament and armamentarium that is routinely available. Another critical requisite is good coronal seal for revascularisation to be successful. MTA is an established material that possess both excellent sealing properties and is biocompatible.[18] Use of double seal of MTA and a Resin bonded restoration the blood clot has been well documented[19,20] and followed in these cases. MTA was placed 1to 2mm apical to the cementoenamel junction in all the present cases.

Pre operatively the periapical lesions that were present, resolved after the treatment. All patients were asymptomatic at follow up appointments. The esthetic concern of discoloration was managed by placement of ceramic prosthesis.

6. Conclusion

Pulp revascularisation procedure has been revolutionary in its endodontic implications based on a minimal invasive concept providing clinically significant improvisation in the treatment plans and infection control. Every procedure has its own set of limitations like calcification, discoloration, lack of standardized clinical evaluation protocols etc.pulpal regeneration is an area that needs further exploration and will greatly influence treatment protocols and outcomes in the future

7. Source of Funding

None.

8. Conflict of Interest

None.

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