



Use of Injectable, Liquid-PRF as an Non-Surgical Adjuvant in Accelerated Periapical Healing of Non Vital tooth: A Case Report .

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Abstract –

Introduction – Regenerative endodontics is the boon today. Different types of Regenerative methods have been used in the recent past including inducing bleeding at the periapical regions. So that induced blood clot may lead to formation of bone at the periapex. Use of blood products in form of liquid PRF shows significant resolution of periapical symptoms and signs. This case report focuses on the safest experimental protocol where product of autologous blood -liquid PRF which has maximum growth factor can be used for resolution of periapical radiolucency, that also in comparatively less average time

The patient's main concerns were the blackish discolouration and broken tooth and important clinical findings tooth were tender on percussion.

The primary diagnoses of Non vital tooth with periapical radiolucency was made, nonsurgical endodontics were the preferred interventions, and research worth treatment outcomes were found.

Liquid or I-PRF shows a promise in early periapical radiolucency resolution and prompt signs of radiographic barrier formation at periapex.

Introduction - Regenerative endodontics is the boon today. Different types of Regenerative

methods have been used in the recent past including inducing bleeding at the periapical regions. So that induced blood clot may leads to formation of bone at the periapex. But sometimes failure to induce bleeding or the unpredictability about various procedures, treatment outcomes including allergic reaction to one or many components used for root canal adjuvant procedures forces us to find more biocompatible alternatives for not only dentin bridge formation but also periapical healing of lesions. Use of blood products in form of liquid PRF shows significant resolution of periapical symptoms and signs. This case report focuses on the safest experimental protocol where product of autologous blood -liquid PRF which has maximum growth factor can be used for resolution of periapical radiolucency that also in comparatively less average time.

Patient information:- A 20 year old female patient came to the Department of endodontics and conservative dentistry at Daswani dental college and research centre Kota, she reported having pain in upper front tooth region of jaw since 4-5 days (Figure 1b). She also gives history of accidental trauma 8 years ago in that region and she does not have any significant medical and dental history.

Clinical findings:- In oral/clinical examination Ellis class III fracture with 11 were found to be tender on



Figure 1a

Figure 1b

Figure 1a-Radiographic picture showing the extent of periapical lesion,

Figure 1b-Clinical picture showing a non vital tooth.

percussion.

Timeline;- 9 months time from first visit to last follow up.

Diagnostic assessment :- clinical, tender on percussion.

Radiographic -Radiovisiogram based intraoral periapical radiograph in relation to 11,12. (Figure 1a)

Therapeutic Intervention: The access opening procedure were done in relation to 11,12, Working length for tooth no.11 is 21mm and working length of tooth no. 12 is 20 mm. Biomechanical preparation(BMP) was done with 21 till 70 K-file and in 12 till 60 K- file. After every step of endodontic filing, irrigation was done with saline., After completion of biomechanical preparation (BMP) canal was dried using paper point followed by placement of triple antibiotic paste containing ciprofloxacin, minocycline and metronidazole and closed dressing was given with cotton and temporary material is placed to prevent inter-appointment leakage .Medication is prescribed.(tab. Amoxicillin 625 mg, tab. Zerodol S.P. ,Tab. Pan D,Tab. Metrozyl 400 mg). for 5 days .

Patient was recalled after 7 days for further treatment procedure, patient was initially assessed for persistence or improvement of clinical symptoms, patient is informed about the treatment options like placement of liquid- PRF in the canal for osseous regeneration and blood was drawn for the same .

The liquid PRF is generated using a blood collection tube with a plastic surface that enables the generation of a liquid PRF matrix without the use of external anticoagulants. At room temperature, the resultant liquid PRF preserves its liquid condition for approximately 15–30 min and forms a fibrin clot thereafter Choukroun's I-PRF (solution/gel): 700rpm/3 minutes. Upon termination of this process, it is possible to observe an orange color area in the tube (I-PRF) and the remaining blood materials below (Figure 2b).Then the tubes were opened carefully to avoid homogenization of the material. We collected 5 ml of I-PRF from the tubes using a 20ml syringe with a 18G

hypodermic needle. This was used in the canal after the removal of temporary material and disinfection of the canal with sodium hypochlorite and copious irrigation with saline. After cleaning the canal, the canal is properly dried using paper point and liquid PRF is injected and the canal. It is filled completely with the help of 27gauge needle as the diameter of apical foramina is about 0.4mm. (Figure 2a) Temporary dressing is placed to prevent inter-appoint leakage from the canal.



Figure 2a



Figure 2b

Figure 2a injection of liquid PRF in root canal of tooth 11.
Figure 2b-Collected blood centrifugation resulting in formation of liquid PRF using I-PRF protocol.

Follow-up and Outcomes:- Patient was recalled in every fortnight time for next two months for placement or perhaps replacement of liquid PRF which is stated as above, followed by placement of cotton dressing and temporary restorative materials. After 60 days, radiograph was taken and radiographic evidence for the apical barrier formation were checked and healing of the periapical lesion was also assessed,

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Afterword every month recall visit was scheduled until there was evidence of radiographic barrier formation or healing of the periapical lesion (Figure 3a,3b,3c)

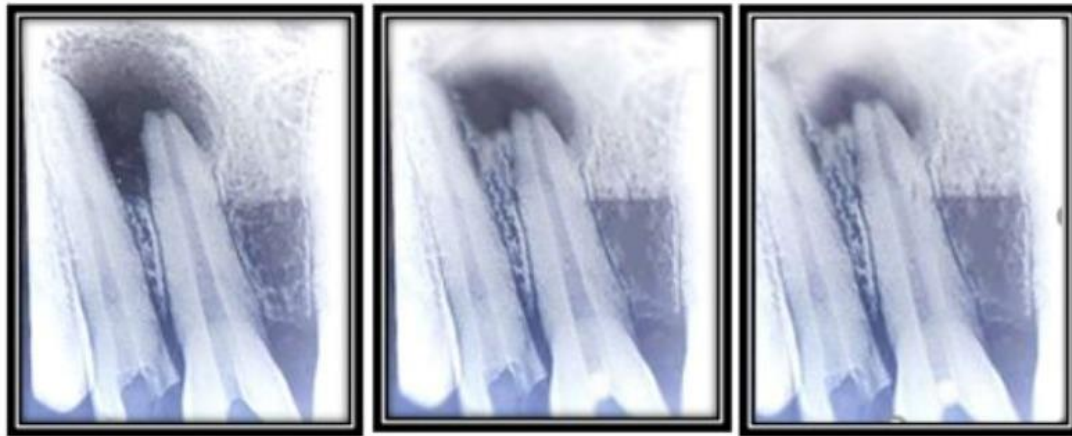


Figure 3a Figure 3b Figure 3c
Figure 3.a.b.c depicting the different phases of healing during 6 month time up to the day of obturation.

After a Follow up of 6 month, radiographically mild evidence of barrier formation was found and also evidence of satisfactory radiographic resolution of the periapical region was noted, biomechanical preparation of the canal was done followed by obturation with Gutta Percha upto the apex.

Discussion :-In patients who show periapical lesion , generally use of calcium hydroxide or mineral trioxide aggregate is recommended , but as the topic of healing or osseous regeneration is concerned, day by day newer or emergent techniques are now employed for successful resolution of periapical lesion. Initially in regenerative endodontics, bleeding was induced at the periapical region which was unpredictable at times but it also gave us an idea of using autologous blood product like PRP or PRF. Similarly, PRP showed quite promise but effect of dilution caused because of anticoagulants addition eliminated quite a volume of growth factors. So PRF was always a quite commendable option. But solid PRF is a membrane of fibrin with the entrapment of growth factors therefore at times while placement of solid PRF all nutrients get squeezed away because of compaction, as the contour of root canal has narrow confines, so recently a solution to this problem was found in form of use liquid PRF.

But before one can see the dramatic effects of PRF one need to eliminate the existing pathogenic biome of the canal.

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At, 9 month follow up, complete periapical healing was observed. (Figure 4a, 4b)

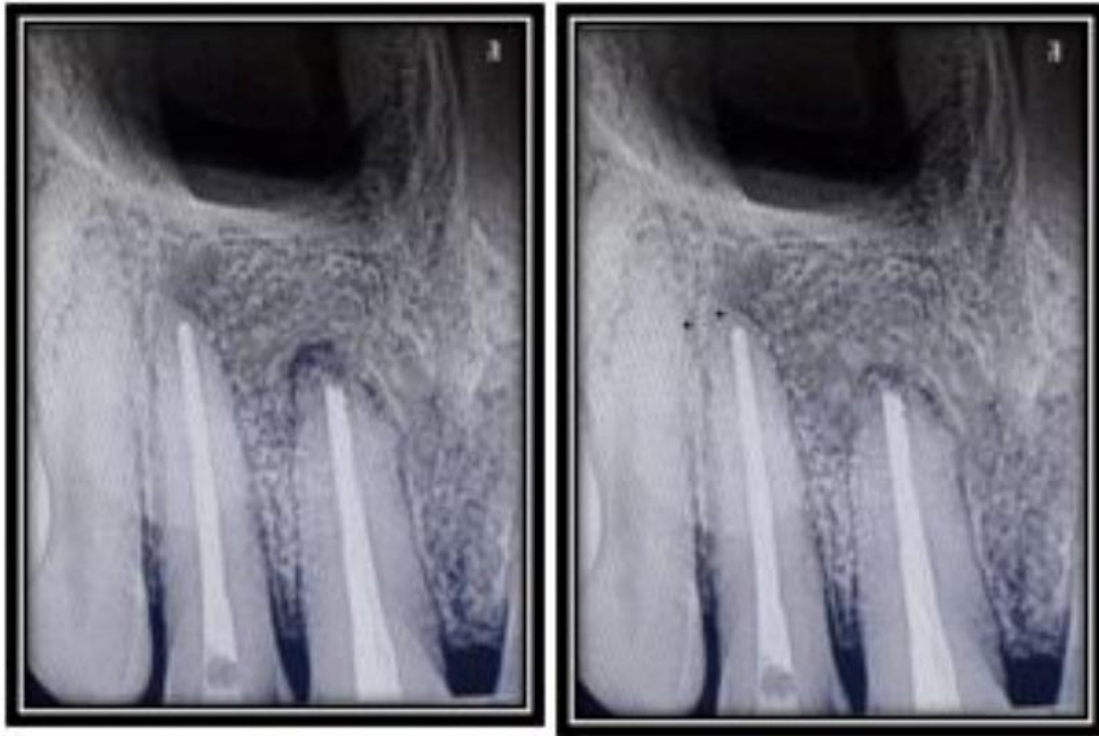


Figure 4a

figure 4b

Figure 4a- post obturation radiograph at 8th month,
Figure 4b- post obturation radiograph at 9th month

In practice it has been found that without application of mechanical instrumentation, a biofilm remains and it is comparatively more resistant to antibacterial agents compared with limited filing of the canal walls.¹

In endodontics, tetracycline has been used to scrub of this smear layer from instrumented root canal walls, as an irrigation in the retrograde cavities during periapical surgical procedures and as an intra-canal medicament. Now a days we use the newer variants minocycline (a derivative of tetracycline group) in commercially available triple antibiotic paste.

Ciprofloxacin and other fluoroquinolones are being used for its broad spectrum of activities, their availability in both oral and intravenous formulations as well as their excellent tissue penetration has proved its efficiency as a potent empirical antibiotic, also know as blind therapy in medicine.² Therefore used in triple antibiotic formulation.

Metronidazole has shown to destroys bacteria cells by permeating their membrane and then binding to the DNA, disrupting the helix structure and causing a very rapid death of the bacteria. It has been shown that metronidazole is effective against anaerobic bacteria therefore the most effective third agent in TAP Paste.²

When we talk about the regenerative procedures involving periapical bleed induction Lovelace *et al.*³ proved that the evoked-bleeding step in regenerative procedures after disinfection with TAP induces the accumulation of undifferentiated stem cells into the canal space from periapex. These cells generally take part in the

pulp regeneration process after effective disinfection. Therefore, root canals disinfected with sodium hypochlorite and TAP had significant reduction in chances of having a periapical lesion, and accentuated chances of gaining root length and wall thickness.

In summation of above, Netea et al⁴ had proved a contradicting statement that stem cells fail to survive when placed in contact with previously treated dentin with triple antibiotic paste at a concentration of 1 g/mL. However, antibiotics tend to lose their effectiveness when in contact with the dentin complex⁵. In addition to above, reducing the concentration of antibiotics decreases their potential cytotoxicity; it also dramatically reduce their antimicrobial efficacy. Thus, a balanced concentration should be used to accomplish effective disinfection but with low cytotoxicity^{1,6}. This is reason we used triple antibiotic paste placement in canal after BMP to clear the canal from pathogenic microbiome for one week time. And now are canal is ready to receive PRF for the healing process.

Physiological thrombin which is available in PRF creates equilateral junctions in polymerized fibrin, which results in long term growth factor release (up to 28 days) and a flexible fibrin network, which is an appropriate microenvironment for cell migration^{7,8}. Thus, PRF is a preferable scaffold in regenerative endodontics and is initially used to accelerate tissue healing⁹. As PRF shows a maximum growth factor release for upto 28 days, we tried to replete the growth factor every fifteen days for four occasions to have a steady supply of growth factor for atleast 75 days.

Extra efforts for evoking bleeding for example as done in cases of induction of bleeding may have caused damage to the Hertwig's epithelial root sheath, which is a crucial element for root development. Consequently, damage to this structure results in no further root development or formation of blunted root tips^{10,11}. Therefore, even when bleeding was induced with the aid of a sharp spreader without lateral or circumferential movements¹², it is visibly difficult to achieve some results.

Also, the presence of leukocytes, cytokines, and few lymphocytes which are present in PRF reduces infection and inflammation. Increase in Angiogenesis due to release of vascular endothelial growth factor, also plays an important role in revascularization¹³. Despite the potential effectiveness of platelet concentrates in promoting the regeneration of the dentin-pulp complex, scientific evidence is lacking. Platelet concentrates are not only a rich source for growth factors but also considered a biomimetic scaffold for endodontic tissue regeneration. PRF functional theory states that PRF stimulates stem cell proliferation and higher expressions of osteoprotegrin proteins and alkaline phosphatase. These proteins are usually identified as odontoblast differentiation markers,⁴. Therefore our experimental protocol highlights the efficiency of use of I-PRF for faster and sustainable results of regeneration.

Conclusion:- Liquid or I-PRF shows a promise in early periapical radiolucency resolution and prompt signs of radiographic barrier formation at periapex therefore more definite protocols and algorithm should be made for more concrete and extensive results.

Patient Perspective:- Patient was quite satisfied with the results and termination of the treatment process.

Informed Consent:- Patient has consented to the process.

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