

## Case Report

**Healing Potential of Different Scaffolds: A Comparative Clinical Study**Dr. Atul Jain<sup>1</sup>, Dr. Sangeeta Nawal<sup>2</sup>, Dr. Padma.Gandi<sup>3</sup>, Dr. Arvind MS<sup>4</sup>, Dr. Mousumi Sarkar<sup>5</sup><sup>1</sup>Prof and HOD, Department of Conservative Dentistry and Endodontics, R.K.D.F Dental College and Research Centre, Bhopal, India<sup>2</sup>MDS III year student, Department of Conservative Dentistry and Endodontics, R.K.D.F Dental College and Research Centre, Bhopal, India<sup>3</sup>Consultant at dental hospital Dubai, UAE<sup>4</sup>Reader, Department of Conservative Dentistry and Endodontics, R.K.D.F Dental College and Research Centre, Bhopal, India<sup>5</sup>MDS III year student, Department of Conservative Dentistry and Endodontics, R.K.D.F Dental College and Research Centre, Bhopal, India**\*Corresponding Author:**

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**Abstract:** PRF along with various additives like Bone graft (BG) and Mineral Trioxide Aggregate (MTA) enhances periapical healing. This comparative clinical study was taken up to evaluate the periapical healing potential of plasma rich fibrin (PRF) as scaffold along with MTA and bone graft. Two patients with a history of trauma and large periapical radiolucent lesion were selected for this study. After access opening and biomechanical preparation, involved teeth were obturated with gutta percha using AH plus sealer. Subsequently periapical surgery was carried out and PRF was prepared by collecting blood from the patients. In the first patient, a mixture of PRF and MTA was placed into the periapical defect, while in the second patient a mixture of PRF and BG was placed. At 1 month, 3 month, 6 month and 1 year follow up was done for evaluation of clinical and radiographic healing. Both the patients remained clinically asymptomatic. Radiographically healing was found to be better with PRF and BG combination.

**Keywords:** Periapical lesion, Mineral Trioxide Aggregate (MTA), Bone Graft (BG), Platelet Rich Fibrin (PRF),  $\beta$ -Tricalcium Phosphate, Platelet Rich Plasma (PRP)

**INTRODUCTION**

Enhancement of the healing using patient's own blood is a unique concept in dentistry. Platelets are primarily involved in wound healing through clot formation and the release of growth factors that initiate and support wound healing [1]. Scaffold is a three dimensional structure that contains growth factors and promotes healing. It can be - Natural-Collagen, Platelet Rich Fibrin (PRF) and Platelet Rich Plasma (PRP). Synthetic - Polyglycolic acid, Polylactic acid [2]. PRF, a commonly used scaffold in regenerative endodontics, has fibrin matrix which helps in migration of fibroblast and endothelial cells and is source of growth factors for revascularization [3].

Along with scaffold of PRF various additives like Bone graft, Mineral Trioxide Aggregate can also be used to enhance periapical healing. Most commonly used bone grafts include  $\beta$ -Tricalcium phosphate, Freeze dried bone graft, Emdogain, Octacalcium phosphate, bioactive glass. The combination of PRF membrane as a matrix and Mineral trioxide aggregate

(MTA) has been demonstrated to be an effective alternative for creating artificial root-end barriers and to induce faster periapical healing for single visit apexification and cases with large periapical lesions [4].

This comparative clinical study was taken up to evaluate the periapical healing of PRF as scaffold along with MTA and bone graft at our Department of Conservative Dentistry & Endodontic. Ethical clearance was taken from the institutional ethical committee. Patients were asked to sign the informed consent form for treatment procedure and publication of their report and photographs after proper explanation.

**CASE 1**

A 20 year-old male complaining of discoloration of the upper left front teeth reported to the department. On intraoral examination, Ellis class III fracture of 21 but no abnormal mobility, swelling or pus exudation was noticed. There was history of dental trauma 6 years back. A periapical radiograph was taken

using the standardized techniques, which demonstrated a large radiolucent lesion around the apex of 21 with ill-defined margins. 21 failed to respond to thermal and electric pulp testing, whereas control teeth (11 and 31) responded within the normal limits and there was no relevant medical history.

After endodontic treatment, surgical endodontic therapy of 21 was planned. Root canal therapy was done using K files by step back method and obturated with Gutta percha and AH Plus sealer.

### Preparation of Scaffold

Simultaneous to surgery, PRF preparation was done using 10 ml of intravenous blood collected from antecubital vein. Blood was collected in a 10-ml sterile tube without anticoagulant and immediately centrifuged at 3,000 revolutions per minute for 10 minutes. After 10 minutes, the middle layer of PRF was clearly visible between RBCs at the base and acellular plasma on top. Using a sterile tweezer PRF was withdrawn from the tube and transferred onto a sterile dappen dish (Fig 1).



**Fig-1: Preparation of PRF**

### Surgical Procedure

Using surgical spirit extraoral antiseptics was carried out followed by local anaesthesia and Oshchenbein Luebke incision was given flap was reflected. On raising flap surgical window was prepared followed by removal of granulation tissue and sent for biopsy. The PRF prepared simultaneously was mixed with MTA on sterile glass slab and filled into the intrabony defect to cover the defect.

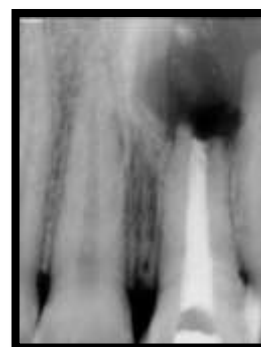
The flap was repositioned and secured in place using 3-0 non absorbable silk with interrupted sutures. Sutures were removed 5 days postoperatively. Patient's regular clinical and radiographic follow up was done at 1 month, 3 month and 6 month interval (Fig 2).



**Fig-2.2: After Conventional root canal therapy**



**Fig-2.1: Pre-Operative Radiograph**



**Fig-2.3: After root resection**



**Fig-2.4: 1 month follow up**



**Fig-2.5: 3 month follow up**



**Fig-2.6: 6 month follow up**

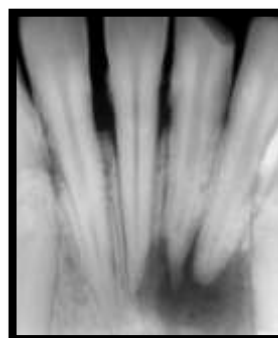


**Fig-2.7: 1 year follow up**

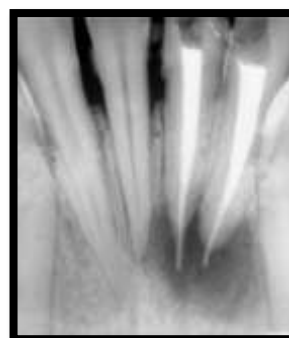
noticed. There was history of dental trauma 12 years back. A periapical radiograph was taken using the standardized techniques, which demonstrated a large radiolucent lesion around the apex of 31 and 32 with well defined margins. 31,32 failed to respond to thermal and electric pulp testing.

After conventional endodontic treatment surgical endodontic therapy of the mandibular left central and lateral incisor was planned. Root canal therapy of 31 and 32 was carried out by step back technique using K files and obturated with Gutta percha and AH Plus sealer. Surgery was carried out in a similar manner as in case 1 by raising Oshchenbein Luebke flap.

PRP was again prepared in a similar manner as in case 1 but it was mixed with bone graft on sterile glass slab and filled into the intrabony defect. The flap was repositioned and sutured. Sutures were removed 1 week postoperatively. Patient's regular clinical and radiographic follow up was done at 1 month, 3 month, 6 month and 1 year interval (Fig 3).



**Fig-3.1: Pre-Operative Radiograph**



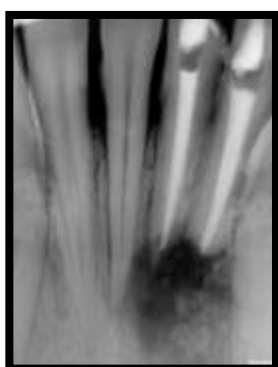
**Fig-3.2: After Conventional root canal therapy**

## CASE 2

A 21 year-old male complaining of fractured lower anterior tooth reported to the department. On intraoral examination, Ellis class III fracture of 31 but no abnormal mobility, swelling or pus exudation was



**Fig-3.3: After root resection**



**Fig-3.4: 1 month follow up**



**Fig-3.5: 3 month follow up**



**Fig-3.6: 6 month follow up**



**Fig-3.7: 1 year follow up**

## DISCUSSION

After periapical surgery and placement of a mixture of, PRF + MTA or PRF + Bone graft, healing of both the cases was evaluated at 1 month, 3 months, 6 months and 1 year period. Clinically both the cases were asymptomatic at all these time periods. Radiographically better healing was seen with PRF and Bone graft combination. **Strindberg** in 1956, **Bender et al** in 1966 and **Mor** in 2004 have all advocated radiographic healing as the accepted criteria for successful outcome of periapical surgery along with clinical absence of symptoms.

PRF offers various advantages, simple to prepare, obtainable by autologous blood sample, minimal blood manipulation without anticoagulants, no addition of external thrombin, absence of immunological reaction, natural fibrin framework with growth factors within, economical and quick option compared with recombinant growth factors [5]. The cytokines within the fibrin mesh are gradually released as the network of fibrin disintegrates [6]. The PRF accelerates the healing of wound edges [7]. According to **Simonperi et al**, [8] the use of this platelet and immune concentrate provides 4 advantages: 1) Fibrin clot maintains and protects the grafted biomaterials and PRF fragments act as connectors between bone particles. 2) Integration of fibrin network into the regenerative site facilitates cellular migration, esp. endothelial cells necessary for the neo-angiogenesis vascularization and survival of the graft. 3) Platelet cytokines (PDGF, TGF- IGF-1) are gradually released as the fibrin matrix resorbs, leading to enhanced healing [9], 4) Leukocytes and cytokines in the fibrin network self-regulate inflammation and infection.

In our study MTA was used along with PRF because of its superior sealing ability and biocompatibility over conventional filling materials. In vivo studies have shown that MTA has the capacity to induce bone, dentin and cementum formation.

In comparison to other root end filling materials, MTA leads to regeneration of periapical tissues including periodontal ligament and cementum [10]. The combination of PRF membrane as a matrix

and MTA has been demonstrated to be an effective alternative for creating artificial root-end barriers and to induce faster periapical healing for single visit apexification of the cases with large periapical lesions [11,12].

In the second case bone graft  $\beta$ -tricalcium phosphate was used along with PRF. Several case reports have demonstrated healing with mature bone and haemopoietic marrow in periapical areas by using this bone graft [13]. Beta-tricalcium phosphate ( $\beta$ -TCP) is an osteoconductive bone graft which gets chemically resorbed with a concomitant release of bioactive ions [14]. Besides promoting wound healing, bone growth, and maturation, PRF mixed with  $\beta$ -tricalcium phosphate bone graft has the advantages of graft stabilization, wound sealing, hemostasis, and improved handling properties [13]. In our study healing observed with this combination was better as compared to PRF and MTA combination.

## CONCLUSION

Addition of PRF to MTA and  $\beta$ -Tricalcium Phosphate allograft accelerates regenerative capacity of bone. When used in combination, they give a predictable clinical and radiographic evidence of bone formation. Based on finding in our cases and those reported by others it appears that the combination of PRF and bone graft provide better healing than MTA and PRF. Although for more conclusive results a wider clinical study needs to be undertaken.

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