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## Case Report

# Management of large periapical lesion with the combination of second generation platelet extract and xenograft: A report of two cases

Pradnya S Nagmode<sup>1</sup>, Balaji Kapse<sup>1</sup>, Harshal V Basatwar<sup>1,\*</sup>, Shubham P Godge<sup>1</sup>, Girish A Bakhtar<sup>2</sup>, Ketki P Kalele<sup>3</sup>

<sup>1</sup>Dept. of Conservative Dentistry & Endodontics, SMBT Dental College & Hospital & Post Graduation Research Center, Amrutnagar, Maharashtra, India

<sup>2</sup>Dept. of Prosthodontics & Crown & Bridge, SMBT Dental College & Hospital & Post Graduation Research Center, Sangamner, Maharashtra, India

<sup>3</sup>VYWS Dental College & Hospital, Amravati, Maharashtra, India



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## ABSTRACT

Periapical inflammatory lesion is the local response of bone around the apex of tooth that develops after the necrosis of the pulp tissue or substantial periodontal disease. Periapical surgery aims to remove periapical pathology to achieve wound healing and regeneration of bone and periodontal tissue. The purpose of this case report is to throw a light on use of platelet-rich fibrin and bone graft in the treatment of large periapical lesion. Platelet rich fibrin (PRF) is a magnificent tissue engineering product and has gained substantial popularity due to its promising results in wound healing bone induction. Bone graft used in both cases in the present case report was xenograft which is similar to human cancellous bone and is known to have osteoinductive as well as osteoconductive properties.

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## 1. Introduction

Periapical pathology occurs as a sequelae of microbial insults from the root canal. Progression of infection from root canal into periapical region results in excessive osteoclastic bone resorption circumscribing the root.<sup>1</sup> This is discernible radiographically, showing a radiolucent lesion and determined histologically, as a cyst or granuloma.<sup>2</sup>

Successful treatment for peri-apical lesion depends on removal of lesion and granulation tissue followed by achieving complete wound healing and regeneration of the bone and periodontal tissue.<sup>3,4</sup> Formation of new bone can occur with repair or regeneration. The most commonly used technique for regeneration is the use of platelet rich fibrin and bone graft materials which can promote tissue or bone regeneration through variety of mechanisms.<sup>5</sup>

Use of PRF accelerate and enhance the body's natural wound healing mechanisms. Strengthening of the regenerative process of human body by utilizing the patient's own blood is a unique concept in dentistry. Postsurgically, blood clots in defect area initiate the healing and regeneration of the hard and soft tissue.<sup>4</sup>

Xenograft is protein extract of bovine bone which results in trabecular structure of hydroxyapatite similar to human cancellous bone. It act as substrate for cell migration and proliferation, hence prove its biologically active nature and role in regeneration.

The aim of this case report is to throw a light on regenerative techniques in surgical management of large periapical lesion because of its superior healing than conventional surgical management.

\* Corresponding author.

E-mail address: [drharshal1601@gmail.com](mailto:drharshal1601@gmail.com) (H. V. Basatwar).

## 2. Case Report 1

A 35-year old male patient reported to department of conservative dentistry and endodontics with chief complain of yellowish white discharge in relation to upper right front region of jaw since 15 days. Past dental history revealed trauma which he sustained 2 years back. At that time he visited nearest dental clinic and did treatment according to dentist's advice. Clinical examination revealed sinus tract and incomplete root canal treatment with right lateral incisor and crown prosthesis with both central incisors. Radiographic examination showed well defined radiolucent lesion of size 3cm × 2cm, root canal treated right central incisor which was done 15 days prior to reporting to institution and implant prosthesis with left central incisor which was done 2 years back post trauma.

As root canal treatment with right central was seems to be satisfactory, so re-treatment was not considered and conventional root canal treatment was planned with right lateral incisor followed by apicectomy and retrograde filling with right central and lateral incisor. In attempt to achieve superior healing and regeneration of bone, platelet rich fibrin (PRF) in combination with bone graft was used. Shaping was done to 30/06 using crown down technique and copious irrigation was done with 5.25% of sodium hypochlorite and 17% of ethylene diamine tetra-acetic acid with normal saline as intermediate rinse. Obturation was done with gutta percha and AH plus sealer using cold lateral condensation technique. Access cavity was then sealed with composite resin.

Patient was informed about risk and benefit of surgical procedure and consent was taken. Hemogram was advised to patient and all parameters were found to be within normal limit.

Extra-oral and intra-oral anti-sepsis was performed using povidine iodine solution. Surgical area was anesthetized by giving right infraorbital and nasopalatine nerve blocks using 2% lignocaine with 1:100,000 adrenaline. With a crevicular incision accompanied by two releasing vertical incisions, a full thickness flap was reflected using periosteal elevator exposing the cortical bone. The exposed cortical bone over the periapical surgical site was removed with the help of Round Bur (SS White, USA) in a Straight Handpiece rotating at slow speed. Constant irrigation was done with normal saline solution throughout the cutting process. Adequate cortical bone was removed so as to have optimum access to completely debride periapical area. Cystic lining was removed in toto and curettage of the infected periapical tissue was done with the help of curettes, and bony cavity was cleaned. Apical 3 mm of the root was resected using a straight fissure bur and retrograde cavity preparation using ultrasonics was done with tooth no 11 and 12. Retrograde filling was done mineral trioxide aggregate with tooth no 11 and 12. Simultaneously 10ml of blood collected from antecubital vein and centrifuged at 300

revolutions per minute for a period of 10 minutes.

PRF was separated from red corpuscles and placed into sterile dappen dish. PRF was mixed with osseograft and augmented into defect bony cavity. Mucoperiosteal flap was repositioned and sutured with 3-0 non-absorbable suture.

Post-operative instructions were given, medication prescribed and patient was recalled on 3<sup>rd</sup> day for follow up and on 7<sup>th</sup> day for suture removal. Recall visits were planned at 3, 6 and 12 months post-surgical to evaluate healing process of periapical defect.



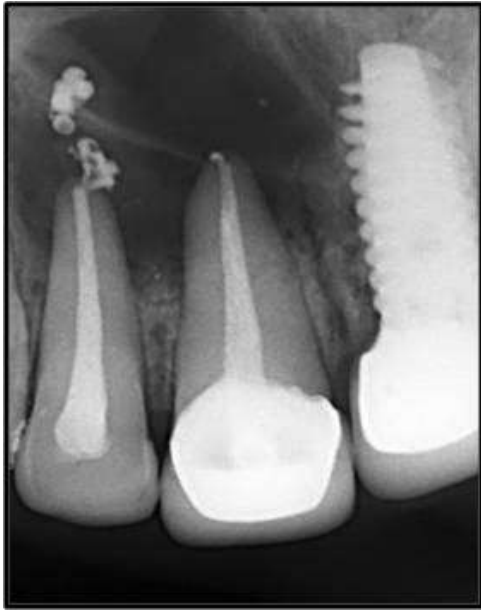
Fig. 1: Pre-operative radiograph



Fig. 2: Pre-operative intraoral view

## 3. Case Report 2

A 30-year old female patient reported to department of conservative dentistry and endodontics with chief complain of swelling and pain in lower front region of jaw since 5 days. Past dental history revealed blunt trauma which she sustained 6 years back. Clinical examination revealed intra-oral swelling with respect to tooth no 31, 41. Radiographic examination showed diffuse radiolucent lesion of size 4cm × 3cm extending from tooth no 32 to 42.



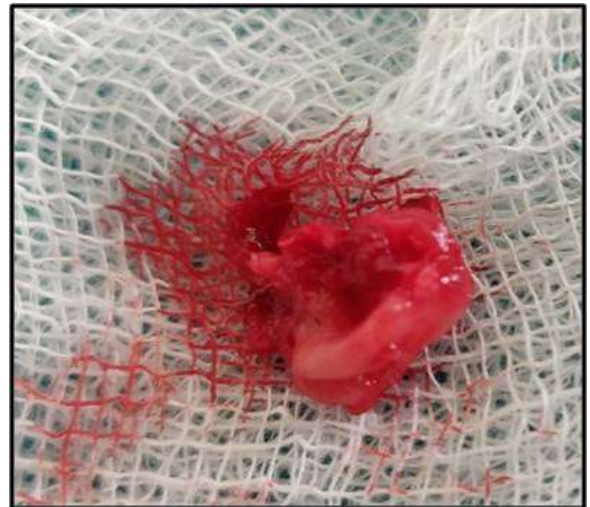
**Fig. 3:** Post-obturation



**Fig. 6:** Cavity with lesion



**Fig. 4:** Incision



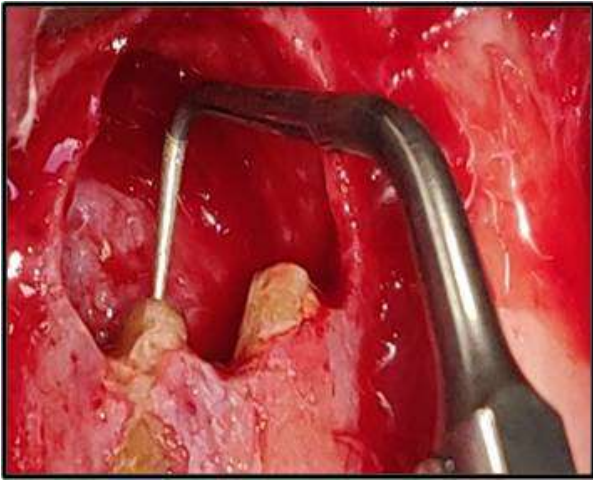
**Fig. 7:** Cystic tissue



**Fig. 5:** Flap reflection



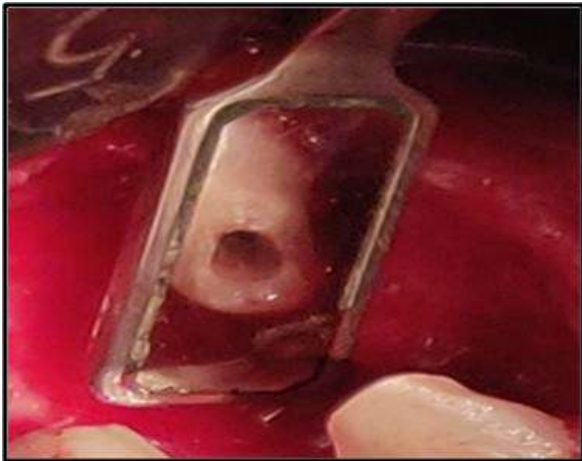
**Fig. 8:** Bony cavity



**Fig. 9:** Retrograde preparation with ultrasonics



**Fig. 12:** PRF along with bone graft



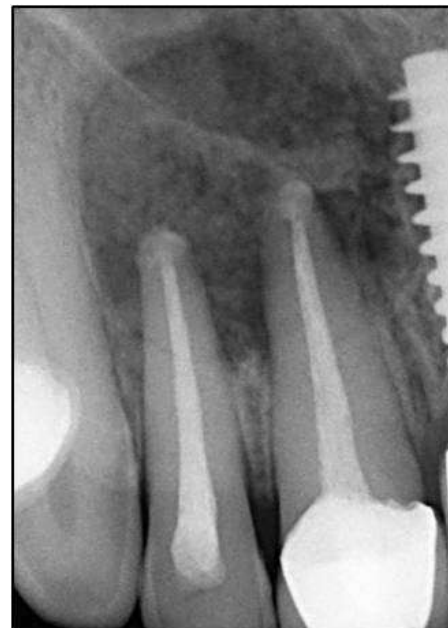
**Fig. 10:** Retrograde cavity preparation



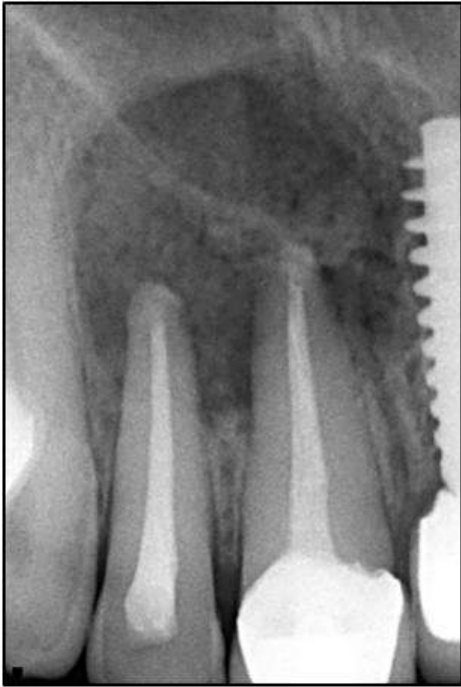
**Fig. 13:** Suture placed



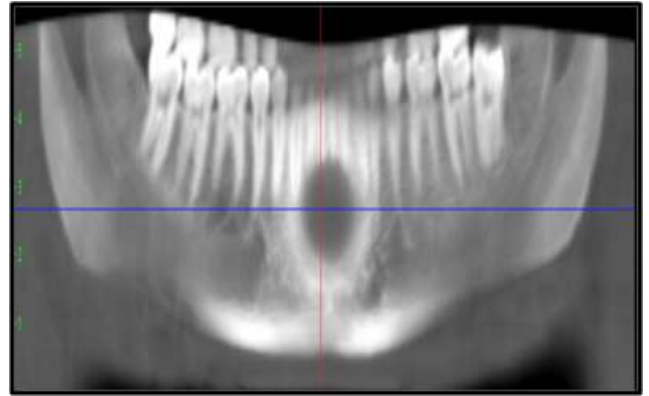
**Fig. 11:** Retrograde cavity filling with MTA



**Fig. 14:** Retrograde filling radiograph



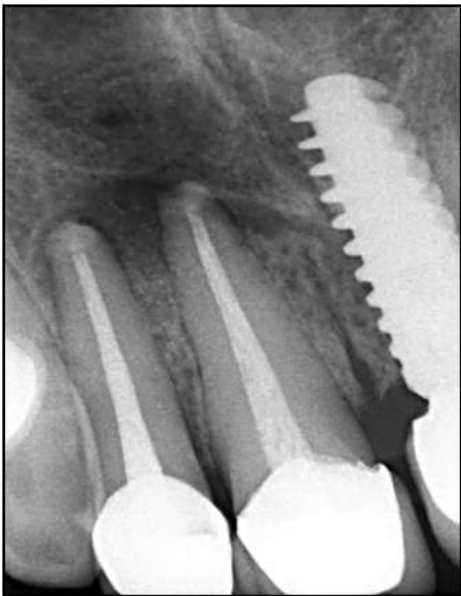
**Fig. 15:** Month follow up



**Fig. 17:** Coronal veiw in CBCT



**Fig. 18:** Axial veiw In CBCT



**Fig. 16:** Year follow up



**Fig. 19:** Working length



**Fig. 20:** Master cone

Conventional root canal treatment was planned with both right and left mandibular central and lateral incisors followed by apicectomy and retrograde filling with both central incisors. For achieving superior healing and regeneration of bone, platelet rich fibrin (PRF) in combination with bone graft was used similar to case number 1. In this case during enucleation it was found that cystic lining was attached with apices of central incisors only, therefore apicectomy and retrograde filling was planned with same teeth. Cystic lesion was stored in 10% formalin after which it was sent to Department of Oral & Maxillofacial Pathology for histopathologic evaluation and diagnosis of radicular cyst was made.

Post-operative instructions were given, medication prescribed and patient was recalled on 3<sup>rd</sup> day for follow up and on 7<sup>th</sup> day for suture removal. Recall visits were planned at 3, 6 and 12 months post-surgical to evaluate healing process of periapical defect.

#### 4. Discussion

Conventional root canal treatment is always first choice for management of periapical lesion which have 85% of success rate. Periapical surgery remains the last resort for dealing with such cases. Post-surgically, healing usually occurs by repair or regeneration. Regeneration has been defined as the reconstitution of injured or lost part to restore the architecture and function of the periodontium and periapical area.<sup>3</sup>

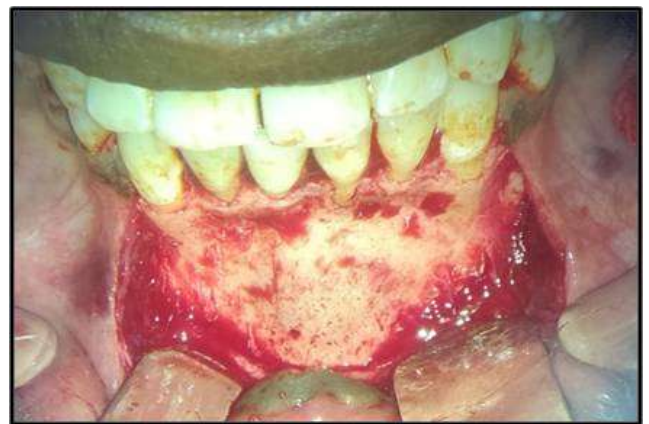
Four major biological factors for bone regeneration is well known by PASS principle which includes primary wound closure, angiogenesis, source of undifferentiated mesenchymal cells, space maintenance, and stability of the wound.<sup>6</sup>



**Fig. 21:** Pre-operative intraoral view



**Fig. 22:** Incision



**Fig. 23:** Flap reflection



**Fig. 24:** Bony cavity



**Fig. 26:** Bone graft



**Fig. 25:** PRF

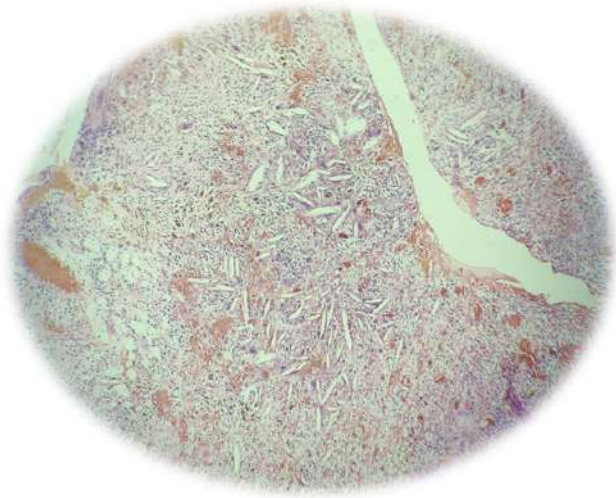


**Fig. 27:** Suture



**Fig. 28:** Retrograde filling radiograph

In vitro studies have proved that PRF releases autologous growth factors gradually up to a period of 4 weeks.<sup>7</sup> The natural and slow polymerization occurring during centrifugation process of PRF results in formation of a homogenous 3-dimensional organization of the fibrin network. The absence of anticoagulant in the test tube leads to immense platelet activation, strengthened by the presence of a mineral phase on the glass tube walls.<sup>8</sup> Bashutski et al, had showed that bone crystals with PRF, resulted in reduction in pocket depth along with significant improvement in attachment and defect fill.<sup>9</sup> Ahmad et al, Ashish et al, Sonal



**Fig. 29:** Histopathology



**Fig. 30:** 3 Month follow up

et al had concluded that combination of growth factors in PRF along with bone graft had shown increased density of bone in many clinical trials.<sup>10–12</sup>

PRF is a matrix of autologous fibrin, with embedded a large quantity of platelet and leukocyte cytokines during centrifugation. The intrinsic incorporation of cytokines within the fibrin network allows for their gradual release over time, as the fibrin mesh disintegrates. The primary component of PRF is high concentration of growth factor present in the platelets which are required for wound



**Fig. 31:** Follow up of 1 year

healing. The PRF acts much like a fibrin bandage, serving as a scaffold to accelerate wound healing.<sup>3</sup>

PRF contains platelet derived growth factor (PDGF), Transforming growth factor b (TGF b-1 & b-2), and insulin like growth factor (IGF), vascular endothelial factor, epidermal growth factor and fibroblast growth factors are believed to play a crucial role in bone metabolism and regulation of cell proliferation. PDGF is an activator of collagenase which promotes the strength of newly formed healed tissue. TGF-B activates fibroblasts to form procollagen which deposits collagen within the wound. PRF facilitates healing by directing the local inflammatory response.<sup>3</sup>

Xenograft used in above cases is osseograft\DMBM is one such demineralized bone derived type-I collagen used for bone void filling. Along with osteoinductive and osteoconductive activity, osseograft has inhibiting action on non osteogenic cells. It is completely resorbable, easy to place and handle.

In both the cases, both PRF and bone graft was placed in the bony defect. The benefit being superior proliferation of human periosteal cells and hence enhance the bone regeneration. Progressive proliferation mode of PRF coagulation results in increased incorporation of circulating cytokines into the fibrin network which further augments wound healing process.<sup>1</sup>



## 5. Conclusion

From the presented cases, it can be concluded that PRF and bone graft is efficacious clinically and radiographically in the treatment of intrabony defect. Incorporation of combination of PRF and xenograft in bony cavity resulted in accelerated the resorption of graft, the rapid rate of bone formation and bone maturation and faster healing of surgical site due to additive properties of both biological agents.

## 6. Source of Funding

None.

## 7. Conflict of Interest

None.

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## Author biography

**Pradnya S Nagmode**, Professor

**Balaji Kapse**, Senior Lecturer

**Harshal V Basatwar**, Post Graduate Student

**Shubham P Godge**, Post Graduate Student

**Girish A Bakhtar**, Post Graduate Student

**Ketki P Kalele**, Associate Professor

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