

# CBCT EVALUATION OF HEALING OF BONY DEFECTS AFTER PERIAPICAL SURGERY USING HA CRYSTALS WITH PRF : A CASE REPORT

Dr. Tapas Paul\*, Dr. H.D.Adhikari \*\*, Dr. Abhijit Niyogi\*\*\*,  
Dr. Parthasarathi Mondal\*\*\*\*, Dr. Amrita Ghosh\*\*\*\*\*

## ABSTRACT

Periapical surgery aims to remove periapical pathology followed by achieving complete wound healing by regeneration of the bone and periodontal tissue. Regeneration of periapical bone defect is a challenge especially in case of large or through and through lesion, because of the time taken for bone regeneration and quick ingression of connective tissue within the defects. That is why it is advocated to use graft materials in place of the defect.

The present case report focuses about healing of a large periapical lesion in relation to #21, #22 through combination use of osteoconductive Hydroxyapatitecrystal (HA) with osteoinductive platelet rich fibrin (PRF) as graft materials after periapical surgery which was evaluated through CBCT.

The patient was evaluated clinically and radiographically on 3rd, 6th and 12th month after surgery. He was asymptomatic and CBCT scans revealed remarkable reduction of area of bone defect (95.31 %) and increase in gain of bone density (104%).

Result of this case report justifies the use of HA & PRF mixture for bony healing of large periapical defect after surgery.

## KEY WORDS

Periapical surgery, HA crystal, PRF, Regeneration

## ABOUT THE AUTHORS

\*Final year Post Graduate Student, \*\*Professor & HOD,  
\*\*\*Professor, \*\*\*\*Associate Professor,  
\*\*\*\*\*Dental surgeon cum Clinical Tutor.

Department of Conservative Dentistry and Endodontics,  
Dr. R. Ahmed Dental College and Hospital,  
Kolkata-700014, West Bengal.

## CORRESPONDING AUTHOR

**Dr. Tapas Paul**

Final year Post Graduate Student, Department of Conservative  
Dentistry and Endodontics, Dr. R. Ahmed Dental College and  
Hospital, Kolkata-700014 Contact no- 8100053147  
Mail id - Drtapas12@gmail.com

## INTRODUCTION

Periapical lesions occur due to long standing endodontic infection of teeth. In cases where conventional root canal therapy fails to eliminate the lesion, surgery is the last alternative. Periapical surgery not only aims to eliminate the pathology but also healing wound by regeneration of bone and periodontal tissue. Regeneration in periapical bone defects is a great challenge to endodontists, especially in case of large bony defects or through and through lesions. This results in healing by repair rather than regeneration. This may be overcome by using various bone graft materials.

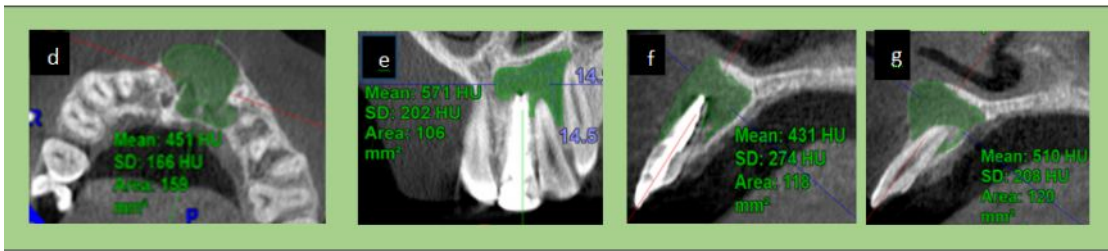
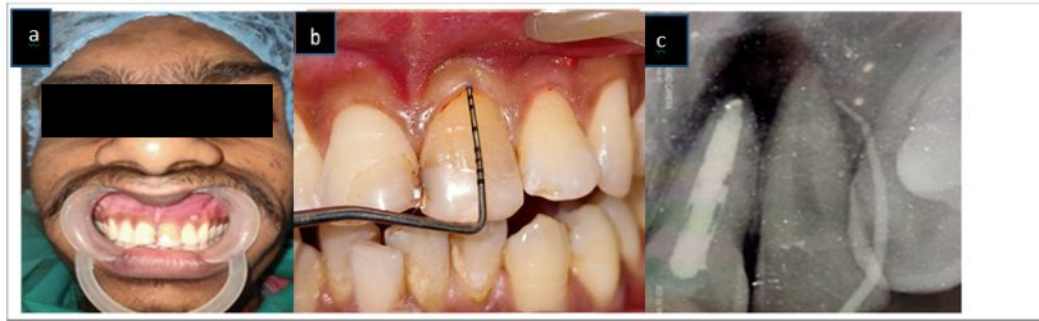
Hydroxyapatite (HA) bone graft is bone conductive in nature, which permit outgrowth of osteogenic cell from existing bone margin to intra osseous defects. Platelet Rich Fibrin (PRF), second generation platelet concentrate possesses both regenerative and osteoconductive properties. Hence, the combination of both has synergistic effect on the bone regeneration. Other benefits of using combination of PRF with HA are improved handling properties of graft materials, graft stabilization, hemostasis, promoting wound healing, bone growth and maturation.

The present case report focuses about CBCT evaluation of healing of bone of a large periapical lesion through combination use of HA with PRF after periapical surgery.

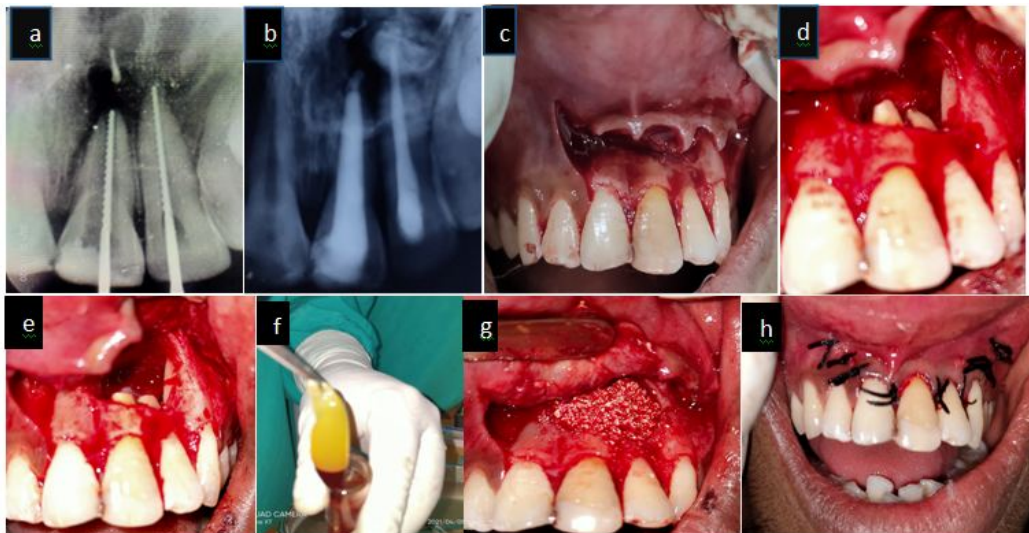
## MATERIAL AND METHODS

A 25-year-old male patient reported to the Department of Conservative Dentistry and Endodontics at Dr. R. Ahmed Dental College & Hospital with pain and complained of pus discharge in upper anterior teeth since last 6months. Patient gave the history of root canal treatment done on #21 one & half years ago. His medical history was non contributory.

On clinical examination, extra orally - no abnormality was detected. Intra orally - there was discolored #21 and discharging sinus was present in relation to #22 [Figure-1a]. Both the tooth were tender on percussion. Periodontal pocket depth was within normal range [Figure-1b]. There was no



**Figure 1: (a) clinical photograph b) showing periodontal probing c) pre op IOPAR. CBCT scans -- (d) Axial, (e) Coronal, (f) Sagittal of#21, (g) Sagittal of#22.**



**Figure 2: (a) WL IOPAR, (b) Obturation , (c) Full thickness mucoperiosteal flap elevation, (d) Bony window preparation, (e) 3mm root resection, (f) PRF preparation, (g) HA +PRF mixed and placed in bone defect, (h) Suture given.**

gingival recession or tooth mobility. IOPAR [Figure-1c] & cone beam computed tomography scans were performed to assess the periapical lesion. [Figure-1d, 1e, 1f & 1g].

The patient was explained about the treatment to be undertaken on him. Informed consent was obtained. Clearance from institutional ethics committee was taken. Under local anesthesia (2% lignocaine and 1:80000 adrenaline) and rubber dam application endodontic treatment on #22 & Retreatment on #21 was performed [Figure- 2a, 2b].

Thorough blood examination was done and patient was administered suitable antibiotics.

Infiltration anesthesia (2% lignocaine with 1:80000 adrenaline) was given. Then

mucoperiosteal flap was elevated [Figure- 2c]. Bony window preparation was done with micro motor with copious saline irrigation [Figure- 2d]. After 3mm root resection [Figure- 2e] with 00 angulation, curettage of the pathology was done and the specimen was sent for histopathological examination. PRF was prepared from patient's 10ml blood through centrifugation in centrifugal machine (REMI R-8C, India) as per technique of Dohan et al. [Figure- 2f]. Then prepared PRF was mixed with Hydroxyapatite crystal (G-BONE, G. Surgiwear Limited, India) and was filled in the periapical defect [Figure- 2g]. The flap was repositioned & sutured [Figure-2h]. Patient was disposed with proper advice. After 7 days suture was removed & patient was asked to report on follow up visits.

## RADIOLOGICAL EVALUATION AT FOLLOW-UP VISITS



Figure 3 :- a-IOPAb- Axial c- Coronal d- Sagittal of #21 e- Sagittal of #22

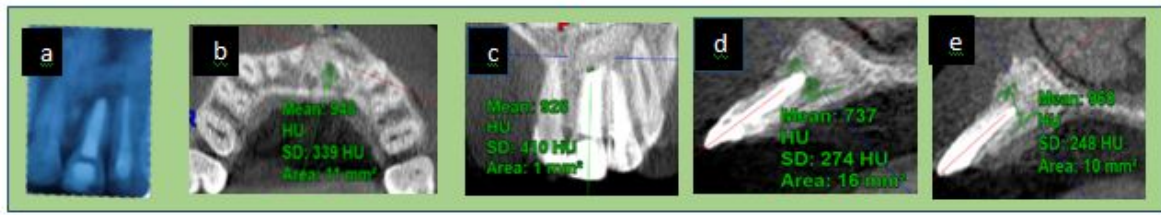


Figure 4 :- a-IOPAb- Axial c- Coronal d- Sagittal of #21 e- Sagittal of # 22



Figure 5 :-a-IOPAb- Axial c- Coronal d- Sagittal of# 21 e- Sagittal of# 22

Table -1; depicts gradual increase in bone density (HU) and decrease of radiolucent area

TIME PERIOD		AXIAL	CORONAL	SAGITAL	AVERAGE VALUE	% GAIN In HU	% Area (A) Reduction
Pre-op	HU	451	571	470	497.33		
	A	159	106	119	128		
3 <sup>rd</sup> month	HU	930	800	651.5	793.83	59.61	89.84
	A	13	1	25	13		
6 <sup>th</sup> month	HU	948	923	848.5	906.5	82.27	93.49
	A	11	1	13	8.33		
12 <sup>th</sup> month	HU	1023	1083	937.5	1014.5	103.98	95.31
	A	7	1	10	6		

Sagittal AV- average area #21 & #22 periapically in sagittal view of CBCT

## RESULTS

On 3rd, 6th and 12th months follow up visit patient was evaluated clinically & radiographically. It was found that the tooth was functioning normally. It was not tender on percussion or palpation. There was no discharging sinus. Probing depth was within normal limit.

IOPAR showed evidences of considerable amount of bone deposition (Figure - 3a,4a&5a). CBCT evaluation revealed there was gradual increase in bone density (HU) and decrease of radiolucent area (Figure -3b, 3c, 3d, 3e; 4b, 4c,4d, 4e & 5b, 5c, 5d, 5e). It was seen that percent increase in bone density was 59.61, 82.27 & 103.95 in 3, 6, 12 months respectively and in the same time interval the decrease in the

radiolucent area was seen to be 89.84, 93.49 & 95.31 percent respectively (Table 1)

## DISCUSSION

Orthograde root canal therapy should be the first option for the treatment of all inflammatory periapical lesions which has 85% of success rate<sup>1</sup>. Nevertheless, failure after orthograde root canal treatment needs surgical intervention. Periapical Surgery has some limitations, such as it is an invasive procedure, requires skilled and experienced operator and also has psychological impact on the patient<sup>2,3</sup>. But periapical surgery remains the last resort when orthograde treatment fails or is not possible.

The final outcome of the nature of wound healing after endodontic surgery can be repair or regeneration depending on the nature of the wound – small, large or through and through. Small defects usually heal by regeneration while other wounds heal by repair due to quicker movement of connective tissue. Regeneration of tissue after a surgical procedure requires (a) recruitment of progenitor /stem cells to differentiate into committed cells, (b) growth/differentiation factors as necessary signals for attachment, migration, proliferation and differentiation of cells, and © local-micro environmental cues like adhesion molecules, extra cellular matrix, associated non-collagenous protein molecules and so forth. Lack of any of these elements would result in repair rather than regeneration.<sup>4</sup>

Hydroxyapatite (HA) bone graft is a porous material which have excellent bone conductive properties and permits outgrowth of osteogenic cell from existing bone surface to bony defects. This also refers to their ability to stimulate and support the proliferation and differentiation of mesenchymal progenitor cells of the host tissue, together with the induction of bone formation<sup>5</sup>.

To further enhance the healing of periapical defects, host modulating agents such as platelet concentrates as for example PRF is used. PRF was first developed in France by Choukroun et al<sup>6</sup>. PRF is an autologous concentrate of platelets on a fibrin meshwork that contains cytokines, leukocytes, and growth factors such as platelet derived growth factor (PDGF), transforming growth factor beta (TGF-beta), vascular endothelial growth factor (VEGF) and epidermal growth factor (EGF). TGF-beta and PDGF promote healing of soft tissue and bone through stimulation of collagen production<sup>7</sup>. Use of PRF has certain advantages over bone grafting materials. Being autologous, it is indispensable in tissue wound healing and acts as better space filler. PRF is easy to obtain and is inexpensive. So this, second generation platelet concentrate possesses both regenerative and osteoinductive properties. PRF is in the form of a platelet gel and can be used in conjunction with bone grafts, which offers several advantages including promoting wound healing, bone growth and maturation, graft stabilization, wound sealing, and hemostasis and improving the handling properties of graft materials<sup>8</sup>. Hence, the combination of both has synergistic effect on the bone regeneration.

Results of this case study evaluated up to the last follow up, suggest that combination of PRF & HA results bone healing & bone growth in a large periapical bone defect.

Similar case reports by Deenadayalan E. et al.<sup>10</sup> and Rahman et al.<sup>4</sup> concluded, that the use of PRF and HA bone graft might accelerate the bone regeneration. However histological studies are more appropriate to confirm the bone regeneration.

## CONCLUSION

This case report provides sufficient evidence that combination of HA & PRF may be used for bony healing of large periapical bony defects after periapical surgery.

## REFERENCES

1. Lin LM, Huang GTJ, and Rosenberg PA. Proliferation of epithelial cell rests, formation of apical cysts, and regression of apical cysts after periapical wound healing. *J Endod.* 2007; 33(8): 908-16.
2. Neaverth EJ and Burg HA. Decompression of large periapical cystic lesions. *J Endod.* 1982;8(4):175–82.
3. Walker TL and Davis MS. Treatment of large periapical lesions using cannulization through the involved teeth. *J Endod.* 1984;10(5):215–20.
4. Hena Rahman, Anil Chandra, Abdul Aziz and Ramesh Bharti Platelet Rich Fibrin and Nanocrystalline Hydroxyapatite with Collagen Combination in Treatment of Periapical Lesion: A Novel Clinical Approach. *British Journal of Medicine & Medical Research* 5(2): 275-282, 2015, Article no. BJMMR.2015.028.
5. Eldibany, R. M., and M. M. Shokry. "The effect of Nanobone® in combination with platelet rich fibrin on bone regeneration following enucleation of large mandibular cysts." *Tanta Dental Journal* 11.2 (2014): 100-108.
6. David M. Dohan, Joseph Choukroun, Antoine Diss, Steve L. Dohan, Anthony J. J. Dohan, Jaafar Mouhyi, Bruno Gogly. 'Platelet-rich fibrin (PRF): A second generation platelet concentrate. Part I: Technological concepts and evolution.' *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology* 2006;101:E37-44
7. Dohan, David M., et al. 'Platelet-rich fibrin (PRF): a second-generation platelet concentrate. Part II: platelet-related biologic features.' *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology* 101.3 (2006): e45-e50
8. Vasundara Yayathi Shivashankar, Dexton Antony Johns, Vidyantath, George Sam 'Combination of platelet rich fibrin, hydroxyapatite and PRF membrane in the management of large inflammatory periapical lesion'-A case report. *Journal of Conservative Dentistry* | May-Jun 2013 | Vol 16 | Issue 3
9. Thanikasalam M, Ahamed S, Narayana SS, Bhavani S, Rajaraman G. Evaluation of healing after periapical surgery using platelet-rich fibrin and nanocrystalline hydroxyapatite with collagen in combination with platelet-rich fibrin. *Endodontology* 2018;30:25-31
10. E., D.Kumar, A. Tewari, R.K., Mishra, S.K., Iftekhhar, H. Management of Large Periapical Lesion with the Combination of Second Generation Platelet Extract and Hydroxyapatite Bone Graft: A Report of Three Cases, (2015)9(1), ZD24-ZD27.