COMPARATIVE ANALYSIS OF BILATERAL PERIAPICAL LESION HEALING AFTER COMBINED USE OF PRF & TWO GRAFTS AND MANAGEMENT OF POST SURGICAL COMPLICATION DUE TO LUEBKE-OSCHENBEIN FLAP.

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INTRODUCTION

Success rate of surgical endodontic therapy may accompany the size of the periapical defect inversely in terms of bone regeneration. It is not easy for an endodontic surgeon to give better prognosis only with the skilled suitable technical procedures when perform surgery where there is/are large periapical defects. We should always consider the regenerative therapies adjunct to well performed surgery to have the best results.

Recently the understanding of the healing process and tissue regeneration with recent advances in materials science, stem cell research and developmental biology have helped to find target molecules and pathways, which can improve the tissue potential to restore a patient's regenerative capacity[2]. Matrix of autologous fibrin, PRF is a second generation platelet concentration rich in immune cytokines and Growth Factors[13] helps in accelerating the healing process in all phases being the best scaffold.

Use of these scaffolds as adjunct to regenerative therapy along with the use of graft materials gives an added advantage for regeneration of tissues within a short period of time than the normal healing process with the control over restoring the lost tissue with best possible results.

CASE REPORT

A 32 year old male patient reported to the Department of Conservative Dentistry and Endodontics with the chief complaint of pain and swelling in upper front region for past 1 month.

History: patient reveals history of root canal treatment in 11 and 21, pain in relation to same for last 3 weeks which is mild in nature and swelling from last one week with severe pain.

Clinically, 11& 21 were discolored. A soft diffuse swelling was present in anterior labial region. Upon radiographic evaluation, two large periapical radiolucencies seen at the apex of 11& 21. Radiolucency in relation to 11 was large with well defined border compared to 21 with irregular border (Fig 1). Based on clinical and radiographic findings, diagnosed as infected periapical granuloma in relation with 11&21.

Fig 1: Pre operative radiograph

SURGICAL PROCEDURE

For the surgical procedure, labial sub marginal rectangular full thickness mucoperiosteal flap (luebke-oschenbein flap) was raised. Labially the bony window was enlarged, and curettage of the granulomatous tissue was done (Fig 2a). Apicectomy was carried out in 11&21, retrograde filling done with GIC-GC Fuji IX (Fig 2b).

The regenerative biomaterial used here is PRF. PRF was prepared by collecting blood without anticoagulant in 10-mL tubes which are immediately centrifuged at 3000 rpm for 10 minutes. and mixed with graft materials, in particular modified hydroxyapatite (G-BONE, Surgiwear Limited, INDIA) and demineralised bone matrix (Osseograft, Advanced Biotech products (P) LTD, USA), the combination of regenerative material and grafts are placed in the bony defect in relation to 11&21 respectively and labial sutures placed (Fig 2c – 2f).

Post-operatively antibiotics, and anti inflammatory drug were prescribed. At the follow up visit after 1 week when the patient returned for suture removal, wound healing was unsatisfactory with flap shrinkage and non healing of approximated flaps at the attached gingival in relation to 11 &21 (Fig 2g).

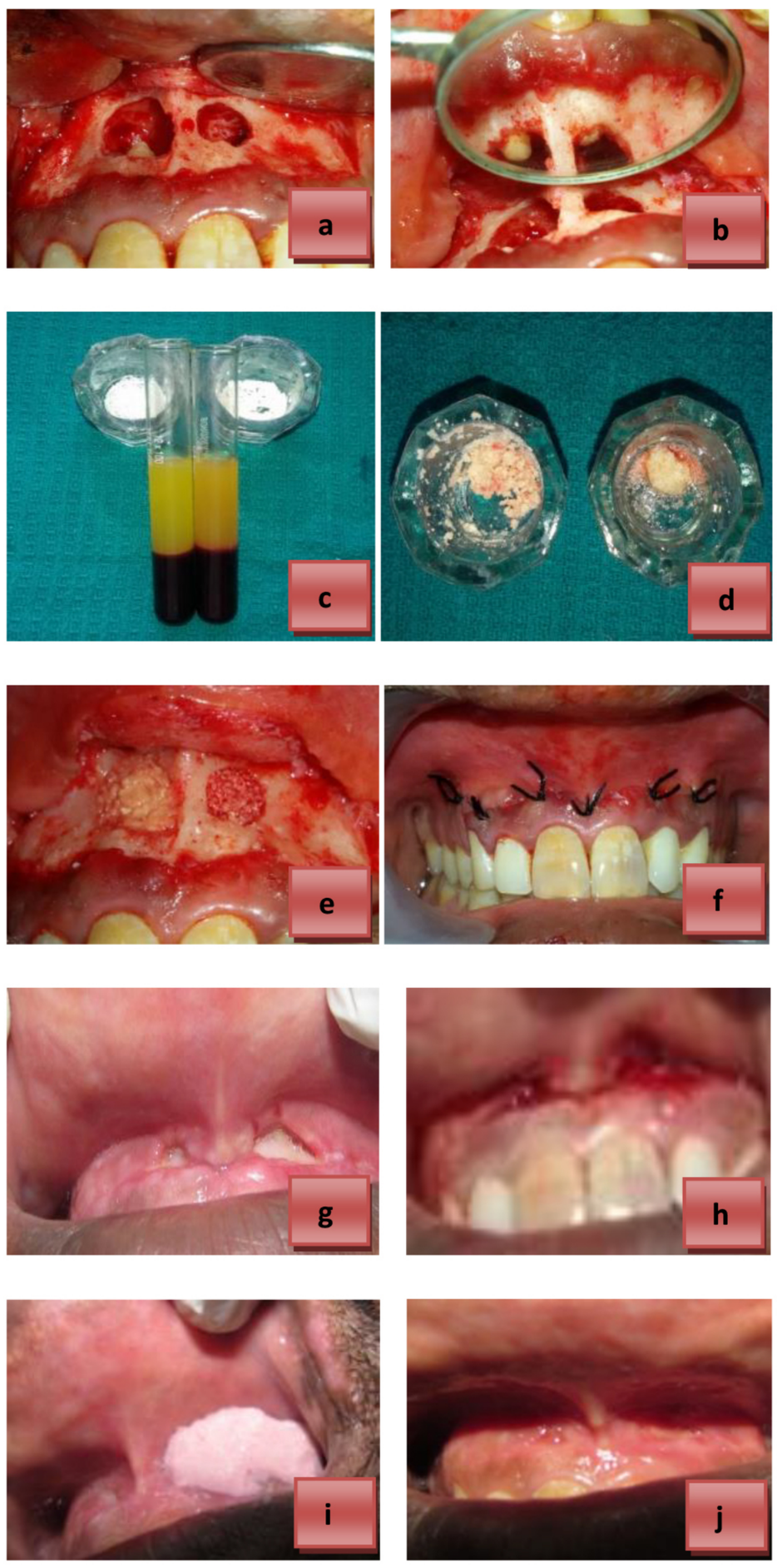

Fig 2: a) Curettage of the lesion; b) Apecectomy and retrograde filling with GIC; c) Grafts with PRF; d) Grafts mixed with PRF; e) Defect filled with combination of graft and PRF; f) Labial suturing; g) Unsatisfactory wound healing after suture removal; h) Curettage done to induce bleeding; i) Curcumin paste applied; j) Healing after 3rd week of curcumin application

The unexpected complication in post operative healing was managed with the application of curcumin paste (Fig 3). In the first post operative visit after suture removal the area was thoroughly cleaned with saline and 2% chlorhexidine alternatively. The bleeding was induced by curetting the area and curcumin paste was applied (Fig 2h&2i) and perio pack was given. patient was recalled after 1 week for review.

Fig 3: Curcumin paste

Appreciable wound healing was evident with improved signs of epithelization and flap approximation on clinical examination after application of curcumin and the procedure was repeated at the second appointment and next review was scheduled after 1 week. Application of curcumin for two week aided in achieving excellent healing with complete epithelization and flap approximation at the end of 3rd week review (Fig 2g).

RELATIVE DENSITY OF BONE HEALING

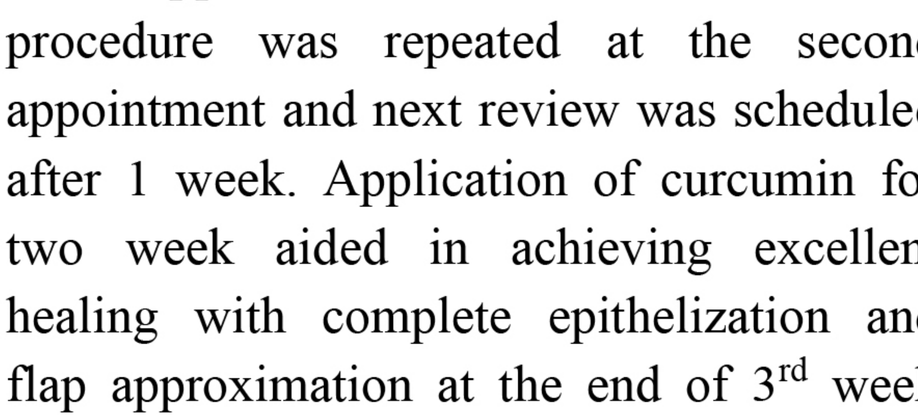

Fig 4: Pre operative, 6 and 9 month post operative digital radiograph

RELATIVE DENSITY OF BONE	RADIOLUCENCY IN 11	RADIOLUCENCY IN 21
AROUND THE LESION	76%	80%
CENTER OF THE LESION (PRE OPERATIVE)	23%	36%
CENTER OF LESION (IMMEDIATE POST OPERATIVE)	30%	45%
CENTER OF LESION (9 MONTH POST OPERATIVE)	69%	72%

Table 1: relative density of bone in the lesion and around the lesion (immediate post operative and after 9 months)

To compare the bone regeneration potential with respect to graft materials, average value of relative density of bone around the lesion and center of the lesion immediate post operative & 9 month post operative were measured in digital radiographic software (Table 1).

Nine month post operative radiograph showed no significant difference between OSSEOGRAFT and G-BONE but both grafts performed excellent to evidence an early bone regeneration when used in combination with PRF.

Case followed-up for 3, 6 and 9 months (Fig 4), 9 month follow-up radiograph shows satisfactory bone fill in the periapical area.

DISCUSSION

Platelet rich fibrin-PRF has autologous fibrin in its matrix and the matrix also contains plenty of growth factors including transforming growth factor-β (TGF-β, including $\beta^{-1}$and β^{-2}-isomers), platelet derived growth factor (PDGF), vascular

endothelial growth factor (VEGF), and epidermal growth factor[13]. The chemotactic and mitogenic properties are exhibited by PDGF which promote & modulate cellular functions involved in tissue healing and regenerative process[1]. Insulin-like growth factor-1 (IGF-1), which is present in plasma, can exerts its chemotactic effects to increase the number of human osteoblasts at the regenerative site[9]. PRF supporting the immune system with its ability to stimulate defense mechanisms which plays an important role in case of wound infection[6]. PRF may act as a supportive matrix for bone morphogenetic proteins[7]. Considering the important role of platelets and leukocyte cytokines in biology of this biomaterial and supporting fibrin matrix constitute the deciding factor responsible for the improved therapeutic potential of PRF[3]. A mode of progressive polymerization signifies increased incorporation of circulating cytokines the fibrin meshes[4].

Clinical application of this platelet and immune concentrate at the time of bone grafting offers the advantages as, the fibrin clot has an important role in protecting the bone grafts and giving a biological connections between bone particles[12] and the integration of this fibrin network as a regenerative site facilitating cellular migration, particularly for endothelial cells required for the neo angiogenesis[5], vascularisation and survival of the graft.

Osseograft consists of demineralised bone matrix prepared from bovine cortical bone sample being non immunogenic flowable particle size of approximately 250 μm. It works on osteoconductive process, it is well integrated into bone tissue and has good bio compatibility. The results with Bovine Derived Xeno graft were having values comparable with those obtained with demineralised freeze dried bone allograft[10,11].

G-Bone Modified Hydroxyapatite granules and blocks are made of Calcium Hydroxyapatite in highly crystalline form. The body absorbs it slowly. It is derived from Bovine Bone which has been sintered at a very high temperature of +500 C. This leaves only pure inorganic structure. It does not carry any risk of transmission of any disease because no organic matter survives such high temperature. It is available in form of granules and blocks, dowels, spheres, plugs. Clinical studies have shown PRF in combination with bone graft showed enhanced bone formation[8].

Curcumin has been shown to possess significant anti oxidant, anti-inflammatory anti-carcinogenic, anticoagulant, anti-mutagenic, and anti-infective effects. Curcumin has also been shown to have significant wound healing properties. It acts on various stages of the natural wound healing process to hasten healing.

CONCLUSION

In this case, the radiograph reveals satisfactory bone regeneration after 9 months. Thus, it can be concluded that PRF is a healing biomaterial, as it features all the necessary parameters permitting optimal wound healing. Long-term follow-up of the

case is essential to evaluate the treatment outcome.

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