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Original Research Paper

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BIODENTINE AS A BIOCOMPATIBLE RETROGRADE FILLING MATERIAL WITH PLATELET-RICH FIBRIN (PRF) AS AN AUTOLOGOUS BIOMATERIAL IN THE MANAGEMENT OF PERIAPICAL LESION

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ABSTRACT The successful treatment of periapical inflammatory lesion depends on the reduction and elimination of the offending organism. Periapical surgery, one of the treatment alternatives, includes the curettage of all periapical soft tissues and sometimes application of different biomaterials to enhance the new bone formation in the defect site like using platelet-rich fibrin (PRF) which acts as a source of growth factors at the healing site. PRF features all the necessary parameters permitting optimal healing. A cystic lesion, which is unable to heal non-surgically, heals well with surgical intervention and use of mineral trioxide aggregate (MTA) as retrograde filling has been reported in literature. Another material with largely improved handling properties; Biodentine™ (Septodont, St. MaurdesFossés, France) was introduced in 2011. It is a calcium silicate based material and manufacturers claim that it can be used for crown and root dentin repair treatment, repair of perforations or resorptions, apexification, and root end fillings. This article presents a case of surgical management of a large cystic lesion using Biodentine™ as retrograde filling material.

KEYWORDS : Autologous Growth Factors, Biomaterial, Platelet Concentrate, Platelet-rich Fibrin, Biodentine Retrograde Filling Material.

INTRODUCTION

Periapical lesion is a local response of bone around the apex of tooth that develops after the necrosis of the pulp tissue or extensive periodontal disease. The successful treatment of periapical inflammatory lesion depends on the reduction and elimination of the offending organism. Root canal therapy, periapical surgery, or extraction of the tooth might be the treatment alternatives. Most of the time teeth with periapical lesions heal satisfactorily after non-surgical endodontic intervention. Abramovitz *et al*. discussed the guidelines of case selection for apical surgery and non-surgical retreatment. They reported that treatment of 24.5% of the cases was impossible without surgical therapy.[1]

Apical surgery is done to surgically maintain a tooth that has an endodontic lesion which cannot be resolved by conventional endodontic re-treatment. The success of surgical therapy depends on complete periapical repair and regeneration, Therefore a biocompatible material is required like a new material Biodentine. In 2009 Biodentine was introduced as a tricalcium silicate cement. It possess excellent handling characteristics because of outstanding viscosity and short setting time of 12 minutes.[2] The healing of hard and soft tissue is mediated by wide range of intra and extracellular events that are regulated by signaling proteins. Platelets play a crucial role not only in hemostasis, but also in wound healing process. Platelets contain important GF that, which are responsible for increasing collagen production, recruiting other cells to the site of injury, initiating vascular in growth, and inducing cell differentiation. These are all crucial steps in early wound healing. Platelet-rich fibrin (PRF), a second-generation platelet concentrate, has shown to be superior to PRP. It was first developed in France by Choukroun *et al. in* 2001.[3] PRF allows one to obtain fibrin membranes enriched with platelets and GF after starting from an anticoagulant-free blood harvest. This means that PRF could release GF with its own biological scaffold for wound healing process.[4,5]

The present case describe the management of the periapical inflammatory lesion using Biodentine with PRF which acts as a source of GF at the healing site, thereby accelerating soft and hard tissue healing.[6,7]

CASE PRESENTATION

A 21-year old female patient reported to the out-patient department of Periodontics, Farooqia Dental College and Hospital, Mysuru, Karnataka with a chief complaint of pain in the upper front tooth region since three days. The patient gave a history of trauma 4 years back (Figure **1a**). Examination of the head and neck revealed no palpable lymph nodes. All vital signs were found to be within normal limits. On Clinical examination revealed draining sinus tract in relation to 21 and congenitally missing 11, 12.

Radiographic examination revealed well-defined periapical radiolucency around the apices of maxillary left central and lateral incisors and impacted supernumerary tooth in the periapical area of 21, 22 (Figure **1b, 1c**).

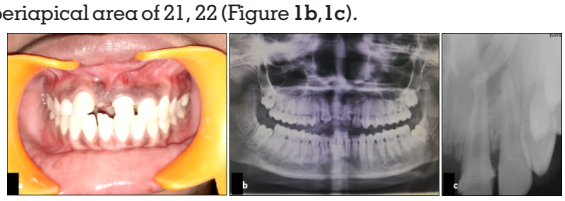

Figure 1: Preoperative clinical view, draining sinus tract wrt 21(a),Preoperative radiograph Showing the periapical lesion and impacted supernumerary tooth in the periapical area of 21, 22(b, c).

MANAGEMENT

The treatment plan was root canal therapy in the left central, lateral incisors and right canine followed by surgical enucleation of the lesion and root-end surgery because of the time constraint of the patient toward nonsurgical approach. The canals were obturated with gutta-percha prior to the surgery (Figure **2a, 2b**). After effective local anesthesia with 2% lignocaine, a full-thickness muccoperiosteal flap was reflected (Figure **2c**). A defect was visible in the cortical plate with the central incisor, which was enlarged to aid in complete curettage of the granulation tissue and allowed room for retrograde instrumentation after root-end resection.

Palatal flap elevated and removed impacted supernumerary tooth (Figure **2d**). This was followed by irrigation with betadine and sterile saline solution. The root-end resection was carried out followed by retrograde cavity preparation and retrograde cavity was filled with Biodentine as retrograde restorative material of 3 mm thickness (Figure **2e, 2f, 2g**).

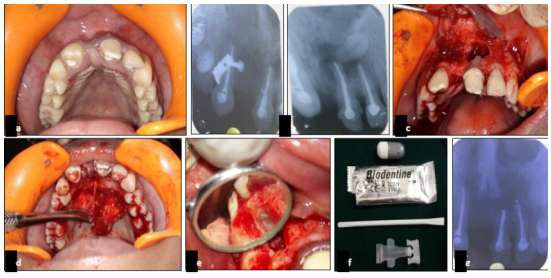

Figure 2: The canals were obturated with gutta-percha prior to the surgery(**a, b**),Incision and full-thickness muccoperiosteal flap reflection and visible defect after enucleation and removal of impacted supernumerary tooth(**c, d**),The root-end resection followed by retrograde cavity preparation and retrograde cavity was filled with Biodentine of 3 mm thickness(**e, f, g**).

PRF preparation was performed using the procedure described by Dohan *et al*.[89] The PRF protocol is very simple. A blood sample was taken without anticoagulant in 10 ml tubes, which was immediately centrifuged at 3000 rpm for 10 min. The PRF clot was then mixed with allograft and packed into the defect to completely fill the bony crypt (Figure **3a, 3b**). Wound closure was then obtained with 4-0 silk sutures (Figure **3c**).

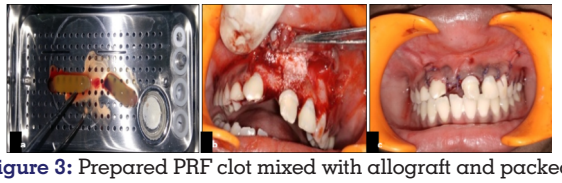

Figure 3: Prepared PRF clot mixed with allograft and packed into the defect (**3a, 3b**), Wound closure with 4-0 silk sutures (**3c**).

Non-steroidal anti-inflammatory analgesics were prescribed and the patient was advised to use chlorhexidine mouth wash for a week. The sutures were removed after 1 week, and satisfactory healing was observed. The patient was recalled at 3 and 6 months. Follow-up radiographs at these intervals showed satisfactory bone regeneration in the periapical defect (Figure 4).Crown preparations done in respect to 13, 21 and 22 and follow up after 6 months and prosthetic rehabilitation done.

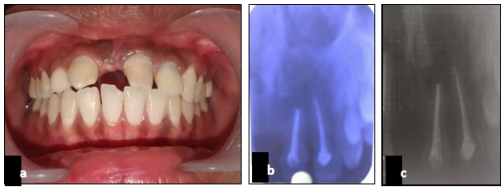

Figure 4: Postoperative clinical view after 3 months showing Soft tissue healing (**a**),3 and 6 months postoperative radiograph showing Enhanced bone healing(**b,c**),Prosthetic rehabilitation after 6 month(**d,e**).

DISCUSSION

Biodentine displayed bioactivity, i.e., activation of angiogenesis and activation of progenitor pulpal cells promoting healing and remineralization. It has shown increased sealing ability compared to MTA. The formation of mineral tags was similar to those observed with MTA along with resistance to acid degradation, as observed in inflammatory sites. The main difference between Biodentine and commercially available MTA calcium silicates is the absence of calcium aluminates and calcium sulfate in the formulation which are known to bring decreased mechanical strength as well as longer setting time.

"The richest of resources in nature lie in the nature itself." The world seems to be going back to natural substitutes for all its queries and dilemmas. Modern day medicine and surgery are certainly no exception to this rule. Utilizing naturally derived blood concentrates without having to use anti-coagulants can be utilized as a substitute to enhance tissue regeneration, fast wound healing and enhance collagen synthesis.

CONCLUSION

This article has shown that routine endodontic therapy followed by surgical intervention with a placement of biocompatible retrograde filling material like Biodentine for management of endodontic periapical lesions of chronicity would positively affect the treatment outcome.

PRF is a totally autologous blood concentrate system that does not require the use of external anticoagulants.PRF improves early wound closure, maturation of bone, and the final aesthetic result of the periodontal soft tissues.

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Nil.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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