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Case Report

PRF: An autologous biomaterial for surgical management of periapical lesion – A case report

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ABSTRACT

Periapical surgery is done to eliminate periapical pathology, it aids in the repair of the wound. Platelet-rich fibrin (PRF) enables the production of fibrin network that are loaded with platelets and growth factors, which are then employed to speed up bone regeneration, hence, used to enhance bone formation. A patient of 18 years reported pain in the maxillary anterior region and clinically slight swelling was appreciated with the same region, diagnosed with periapical inflammatory lesion, and managed by performing periapical surgery using PRF. Optimal healing and regeneration of bone were achieved in this case. PRF is the material of choice for many clinicians nowadays since it shows its regenerative property even when used alone or in addition to any other biomaterial. Other than having a high concentration of platelet, it has numerous growth factors that readily repair and regenerate hard tissue.

Keywords: Case report, Platelet-rich fibrin, Apical surgery, Apicoectomy, Autologous biomaterial

INTRODUCTION

The symptomatic periapical pathologies are the disease of the necrosed pulp and its management primarily rests on disinfection of root canals, that is, non-surgical management.[1] Periapical surgery, apical curettage, apicoectomy, or extraction of the tooth are the surgical treatment choices that are opted as last resort.[2] However, in cases of large periapical defect or pathology, surgical approach can be the primary treatment of choice. The success of endodontic treatment completely depends on periapical healing and bone formation.[3] Newer insight into periapical surgery is the use of various biomaterials to fill the defect or lesion to promote healing and new bone formation.[3] The use of such biomaterials to achieve healing and regeneration in the periapical region, after proper curettage of the lesion is known as regenerative therapies.

Ross *et al*., 1974, discussed the growth factor present in platelets and its role in the regeneration of tissue and bone.[4] Platelet-rich fibrin (PRF) is the next-generation platelet concentrate, it is derived by naturally and progressively polymerizing blood in a centrifuge. The polymerized fibrin network achieved after centrifugation has a tetramolecular structure with platelets, leukocytes, cytokines, and circulating stem cells which are well organized than a natural clot. The primary benefits of PRF are effortless preparation and the absence of strict biochemical handling of blood with no anticoagulants.[5] It has proved its superiority over platelet-rich plasma (PRP) in bone and tissue healing in many clinical scenarios.

CASE REPORT

A male patient aged 18 years came to the Department of Pediatric Dentistry, Saraswati Dental College and Hospital, Lucknow. His complaint was pain and swelling in the maxillary anterior region with a history of trauma due to a road accident 1 year before reporting.

On examination, redness and swelling were present on the palatal surface in relation extending from #21 to #22 and slightly palpable swelling was noticed on the labial aspect of the respective region as well. The teeth involved had pain on percussion.

The teeth under question were insensitive to the electric pulp test. Periapical radiolucency around the apices of #21 and #22 was revealed radiographically [Figure 1a and b] suggestive of periapical abscess.

Periapical endodontic surgery was planned. The treatment procedure along with the use of PRF was explained to the patient. Informed consent was taken from the patient.

Before the surgery, access opening was done with #21 and #22 followed by biomechanical preparation [Figure 1c] and obturation of the canals was planned to be done during the surgery.

After an effective anesthesia administration in aspect to tooth #11 to #22, a full mucoperiosteal flap was reflected by giving one horizontal and two vertical releasing incisions involving #11–#22. After flap reflection, cortical bone over root ends of #21 and #22 were removed with a slow speed bone cutting bur and constant saline irrigation [Figure 1d]. A bone curette was used for apical curettage, then root ends of #21 and #22 were resected (<2 mm), further canal patency was checked using file [Figure 1e], as planned immediate obturation of the canal was done [Figure 1f]. For PRF preparation, 10 ml of blood sample was withdrawn [Figure 2a] and collected in a test tube without anticoagulant. The collected sample was centrifuged at 3000 rpm for 10 min using a centrifuge machine. The resultant fibrin clot had three layers an acellular layer of plasma, a layer of platelets, and a layer of red blood cells at the top, middle, and bottom of the test tubes, respectively. A layer of red blood cells was separated by scrapping it, and finally, PRF gel obtained [Figure 2b] was filled into the bony cavity with proper care [Figure 2c].

After filling the cavity with PRF gel, a 3–0 silk suture was used for suturing to relocate the flap in position [Figure 2d]. Proper medications were prescribed including antibiotics, analgesics, and mouth rinse. A proper post-operative evaluation was done and sutures were removed after 7 days.

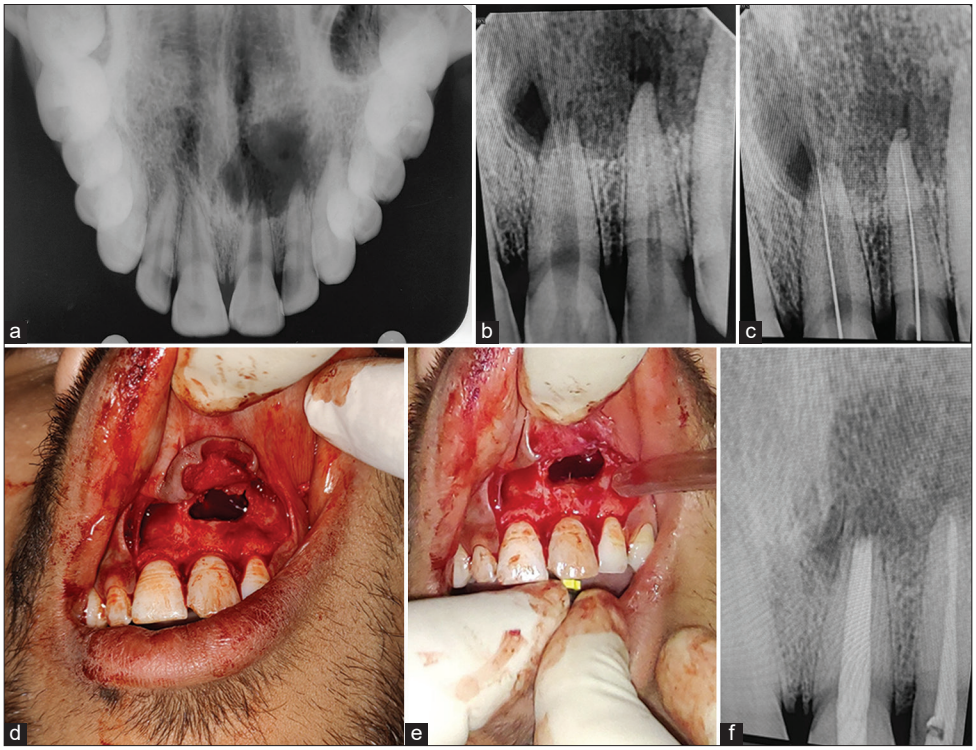

Figure 1: (a) Pre-operative occlusal radiograph showing the lesion, (b) pre-operative IOPA, (c) working length determination, (d) a Full-thickness flap raised and bony window created, (e) file inserted to check the patency of canal, and (f) immediate post-operative IOPA after apicoectomy and obturation of the canals.

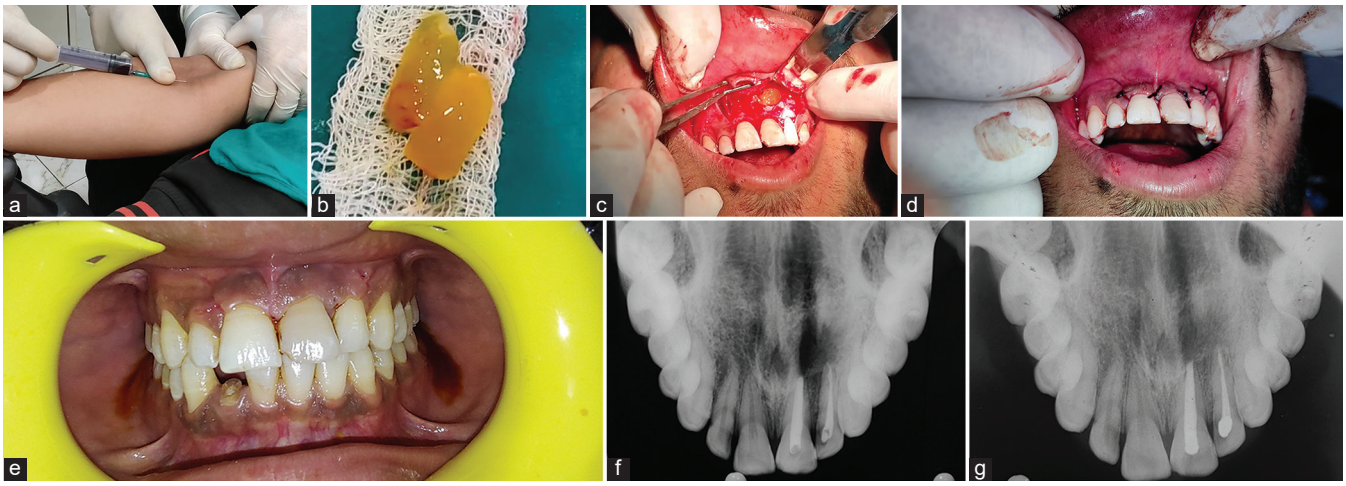

Figure 2: (a) Aspiration of blood sample, (b) prepared PRF after centrifugation, (c) PRF placed up to the brim of the defect, (d) silk sutures placed, and (e) 1-month follow-up, (f) 3 month follow-up occlusal radiograph, (g) 6 month follow-up occlusal radiograph.

Further follow-ups were scheduled after 1 month [Figure 2e], 3 months [Figure 2f], and 6 months [Figure 2g].

Outcome

A satisfactory soft tissue was achieved on clinical evaluation after 1 week, there was no pain or discomfort. Radiographic evaluation after 3 months and 6 months showed the progressive formation of bone concerning #21 and #22.

DISCUSSION

Recent studies are focusing on tissue regeneration, that is, reproduction or reconstruction of lost tissue to restore its form and function. In periapical surgery, this refers to the formation of lost alveolar bone and other surrounding structures along the root of the tooth. Many studies on bone healing aimed to increase bone regeneration along with the volume of regenerated bone to maximize the predictability of wound healing. It cannot be said with conviction that factors such as bone morphogenetic protein-2, recombinant platelet-derived growth factor-BB, platelet-rich plasma (PRP), PRF, or their combination are responsible for bone healing.

In recent times, PRF has proved its potential to regenerate lost tissue in oral and maxillofacial regions. It was developed by Choukroun *et al.* in 2001, the produced PRF accumulates platelets and releases cytokines in a fibrin clot, this makes it an ideal biomaterial for wound healing of larger periapical bony defects.[6]

PRF can be easily prepared from the patient's blood, is inexpensive, and is possibly a very beneficial ingredient for enhancing wound healing. The PRF contains all the components in a blood sample that is helpful for immunity and healing. It is an immune and platelet concentration accumulating on a single fibrin membrane. Although it is neither fibrin glue nor a conventional platelet concentrate, this unique biomaterial resembles an autologous cicatricial matrix. Just blood has been centrifuged; nothing more. With the addition of platelets, leukocytes, cytokines, and circulating stem cells, PRF is made up of a fibrin matrix polymerized into a tetramolecular structure.[7,8] According to certain research, PRF is a biomaterial that promotes healing and has a high potential for regenerating bone and soft tissue without triggering inflammatory responses. It can be used alone or in conjunction with bone grafts to help with hemostasis, bone growth, and maturation.[9,10] Growth factors are the main substance found in PRF platelets. Among the many growth factors found in PRF, TGF-1 and 2, IGF, PDGF, epidermal growth factor (EGF), vascular EGF, and fibroblast growth factors are present. These factors are thought to be essential for bone metabolism and may even be able to control cell proliferation. Collagenase is activated by PDGF, strengthening the tissue that has healed. TGF is a fibroblast activator that encourages the production of procollagen, which then deposits collagen in the wound. In addition, PRF aids in reducing the local inflammatory response, which enhances healing.[11-13]

Hence, PRF can be one of the ideal biograft materials for filling bony defects while performing periapical surgeries.

CONCLUSION

The literature suggests that the administration of PRF increases the number of growth factors present in the wound and aids in tissue healing and bone formation. The excellent clinical outcomes are seen in this case study support this theory. More clinical cases and research are needed to verify the results.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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