Medico Research Chronicles

ISSN No. 2394-3971

Case Report

TREATMENT OF PERIAPICAL LESION WITH PLATELET-RICH FIBRIN – A BIO-FUEL FOR TISSUE REGENERATION: A CASE REPORT

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Submitted on: August 2015
Accepted on: August 2015
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Abstract:
Excogitation in the concept of tissue engineering has brought about a drastic improvement in the healing response of tissues. Wound healing is a staged process which involves the activity of leukocytes and platelets. The growth factors present in platelets are important to guide the regenerating cells to the area of healing. Platelet-rich fibrin is one such material that holds these growth factors enmeshed in the fibrin network resulting in their sustained release over a period of time that can accelerate the wound healing process. Now-a-days platelet-rich fibrin is used in various treatment procedures in endodontics. This case report illustrates the use of platelet-rich fibrin in bone regeneration after periapical surgery.

Key words: Periapical surgery, Platelet-rich fibrin, Bone regeneration.

Introduction:

Treatment of endodontic therapy depends on complete repair and regeneration of periapical tissues. Nonsurgical endodontic treatment is a highly predictable treatment option in most of the cases. However, teeth with persistent periapical lesion unresponsive to non-surgical approach require periapical surgery in order to remove the pathological tissues and to eliminate the source of irritation and promote healing[1]. In the last few decades a variety of biomaterials have been tested for their contribution in healing and regeneration of the soft and hard tissues after periapical surgery. In recent times, a variety of platelet concentrates has been developed with an idea to combine fibrin sealant properties with the growth factors in platelets, thereby providing an ideal base for wound healing and tissue regeneration[2]. Platelet rich fibrin (PRF) also called as Choukroun's platelet-rich fibrin named after its inventor was developed in France by Joseph Choukroun et al. in 2001. They used PRF to improve bone healing in cases of implants[3]. PRF is a second generation platelet concentrate. It is an autogenous osteoinductive material that

enhances osteogenesis in comparison to the physiological healing process. It constitutes components of blood sample that are beneficial to improve wound healing and immunity. Ross et al. were amongst the pioneers who first described a growth factor from platelets[4]. PRF is now used in various treatment procedures in oral & maxillofacial surgery, endodontics and in periodontics. The present case evaluates the bone regeneration achieved by using PRF after periapical surgery.

Case report

A 23 years old female patient reported to the department of Conservative Dentistry & Endodontics of Guru Nanak Institute of Dental Sciences & Research, Kolkata with chief complaint of broken and discolored front tooth with a small palatal swelling in relation to that tooth (Fig 1). She gave history of trauma to that tooth few years ago. Medical and familial history was noncontributory. On clinical examination it was found that maxillary right central incisor was broken and discolored. A periapical radiograph was taken using the standardized techniques, which revealed the presence of a large oval shaped radiolucent lesion involving the apex of the tooth 11 (Fig 3). We came to the provisional diagnosis of cystic apical periodontics associated with a non-vital tooth.

Orthograde endodontic treatment and periodic follow up was planed and if required surgical intervention may have to be done. Patient was explained about the treatment procedure and prognosis and consent was taken.

Routine endodontic treatment was done maintaining proper isolation protocol. As the lesion persisted after two follow up examination at six month interval we opted for surgical intervention. Preoperative blood examination was done accordingly.

PRF Preparation: PRF was prepared in accordance to the protocol developed by Choukroun et al. Just before surgery. 10ml of patient's own blood was collected without using anticoagulant and immediately centrifuged in table-top centrifuge machine for 10 minutes at a speed of 3000 revolution per minute. After centrifugation, three layers were obtained in the test tube. The topmost layer consisting of acellular plasma (platelet poor plasma), PRF clot in the middle and RBCs at the bottom of the test tube. The middle layer of the PRF clot is then removed with sterile tweezers and separated from the underlying RBC layer using scissors and then transferred onto a sterile dappen dish and stored in a refrigerator.

Surgical procedure

The surgical procedure included reflection of a full thickness mucoperiosteal flap by sulcular incision and two relieving vertical incisions. Debridement of the tissues at the defect site was followed by irrigation with sterile saline solution. Root end resection was done at the level of 3mm from root tip; root end cavity prepared using ultrasonic retro tips and filled with MTA. Then PRF gel was carefully placed into the cavity till the entire cavity was filled (Fig 2). Wound closure was done with 3-0 black silk suture. Analgesic and antibiotics were prescribed for five days post-surgically. Sutures were removed after seven days. Then the patient was reviewed at regular intervals of one week, one, three, and six months (fig 4). The case was evaluated both clinically and by radiographs. The case was evaluated clinically for edema, post operative pain, signs of infection. Clinically the patient was asymptomatic and radiological examination revealed complete bone regeneration at the end of six months.

Discussion

Most periapical lesions heal uneventfully after conventional endodontic treatment. In this case, as the disease persisted even after the systematic endodontic treatment which led us to decide in favor of surgical

intervention to remove pathological tissues and simultaneously eliminate the source of irritation that could not be removed by the orthograde root canal treatment. Bone regeneration after surgery takes place in a very slow manner. Hence, to enhance the healing process a number of bone grafts are being tried out. The objective of using a bone graft is to achieve successful and complete healing of the bone[5]. Bone grafting is the most common form of regenerative therapy.

Blood and blood products have been used over a long period of time for various purposes, including the use of serum and individual components. Various researches are now going on to explore the fact that platelets could be used to modulate regeneration, and for repair and healing of the tissues [6, 7]. PRF represents a new step in the platelet gel therapeutic concept with simplified processing minus artificial biochemical modification which was required for the first generation platelet concentrate i.e. platelet rich plasma. The technique of PRF preparation requires neither anticoagulants nor any additive, making the preparation simple and cost effective. Platelet rich fibrin consists of a fibrin matrix polymerized in a tetra-molecular structure with the incorporation of platelets, leukocytes and cytokines, and the presence of circulating stem cells[8]. The physiologic fibrin matrix of PRF, obtained as a result of slow polymerization, has the ability to hold various growth factors and cytokines and release them at the wound site for a prolonged period of time which play important role in various stages of wound healing promoting periapical tissue regeneration[9]. Transforming growth factor Beta-1 and Platelet-derived growth factor are the typical two growth factors which promote healing of soft tissue and bone through stimulation of collagen production to improve wound strength and initiation of callus formation [10]. Vascular endothelial growth factor is a major angiogenic growth factor. It acts on endothelial cells initiating blood vessel formation. Insulin like growth factor, which stimulates osteoblast proliferation, is among the other growth factors present in PRF. The leukocytes and immune cytokines like IL 1β, IL 6, IL 4, TNF α trapped in PRF give it the anti-infectious effect and lets PRF act as an immune regulation mode [11].

There are some limitations of PRF. Owing to the fact that PRF is an autogenous product, its availability in large amount is a concern. Hence, its usage in surgical procedures should be well supervised. It has a short handling time. As PRF possesses circulating immune cells and antigenic molecules, it cannot be used as an allogenic material[12].

Conclusion

With the present knowledge, it can be confirmed that PRF can be considered as a therapeutic biomaterial. The application of this autogenous biomaterial could present new possibilities for enhanced healing and functional recovery. However, the effectiveness of PRF in regenerative procedures should be evaluated in studies involving a large number of subjects.

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Figure 1

Figure 2

Figure 3

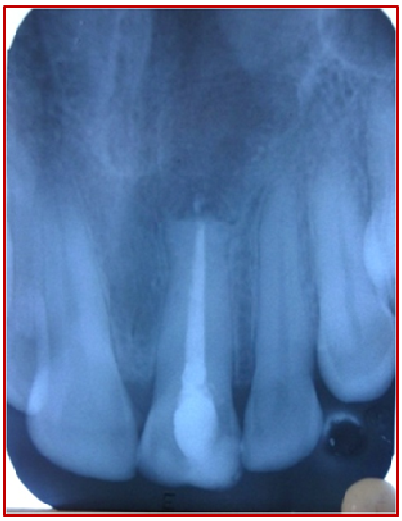

Figure 4