Surgical Management of a Large Periapical Lesion with Platelet-Rich Fibrin and Bone Graft - A Case Report

Debojyoti Majumdar¹, Priyanjit Saha², Soumita Samanta³, Dibyendu Majumdar⁴

¹ Post Graduate Trainee, Department of Conservative Dentistry & Endodontics, Guru Nanak Institute of Dental sciences & Research, Panihati, Kolkata-114, West Bengal, India.
² Post Graduate Trainee, Department of Conservative Dentistry & Endodontics, Rama Dental College Hospital & Research Centre Kanpur 117/k/137, Sarvodaya Nagar, Kanpur - 208025 ,UP, India.
³ Post Graduate Trainee, Department of Conservative Dentistry & Endodontics, Guru Nanak Institute of Dental sciences & Research, Panihati, Kolkata-114, West Bengal, India.
⁴ President Dental Council of India.

Abstract: Periodontal disease is an inflammatory disease leading to periodontal attachment loss and bone destruction. The objective of periodontal therapy is to regenerate the lost periodontal supporting tissues. Platelets are rich in growth factors that may contribute to an accelerated process of tissue regeneration. Platelet rich fibrin (PRF) is now becoming interestingly popular regenerative agent when used alone or in combination with other regenerative materials. Besides, being rich in platelet concentrate, it is also a reservoir of many growth factors that promote successful hard and soft-tissue healing. Its relative ease of availability from the patient’s own blood also adds on to its success story. We present here a case report with a six month follow-up of a large periapical lesion, which was treated by means of combination of autologous PRF with bovine derived xenograft, and assessed clinically and radiographically.

Keywords: Periodontal disease; Periodontal therapy; Demineralised bone matrix (DMBM); Xenograft; Platelet rich fibrin (PRF); Bone grafts

1. Introduction

The tooth along with its pulp tissue and supporting structures should be viewed as a biological unit. The interrelationships between pulpal and periodontal disease primarily occurs by way of intimate anatomical and vascular connections between the pulp and the periodontium. Pulpal and periodontal problems are responsible for more than 50% of tooth mortality. On the basis of the pathologic origin, Simon et al¹ classified endodontic-periodontal lesions into primary endodontic lesions, primary endodontic lesions with secondary periodontal involvement, primary periodontic lesions, primary periodontic lesions with secondary endodontic involvement, or true combined lesions. Diagnosis is often challenging because these diseases have been studied as separate entities, and each primary disease may mimic clinical characteristics of the other disease. Pulp tissue succumbs to degeneration by way of a multitude of insults such as caries, restorative procedures, chemical and thermal insults, trauma, and periodontal disease. When products from pulp degeneration reach the supporting periodontium, rapid inflammatory responses can begin that are characterized by bone loss, tooth mobility, and sometimes sinus tract formation. The objective of periodontal therapy is to regenerate the lost periodontal supporting tissues. However, periodontal regeneration requires a sequence of biological events including cell adhesion, migration, proliferation and differentiation. A combination of growth factors may more effectively stimulate formation of mineralized as well as non mineralized tissues ². Ross et al³ suggested the regenerative potential of platelets in the year 1974, and they described a growth factor from platelets. Platelets are rich in growth factors that may accelerate tissue regeneration. During the early stages of wound healing, platelets released growth factors, including platelet derived growth factor, insulin like growth factor-I and transforming growth factor-β, initiate a cascade of cellular and molecular events that result in wound healing in a highly regulated and coordinated manner . The application of these growth factors to bone and periodontal regeneration has been investigated using numerous in-vitro and in-vivo models with promising results ⁴-⁶. Xenografts used in the
treatment of infrabony defects can be both bovine bone and natural coral, these are also referred to as anorganic bone, since they are suggested to remove all cells and proteinaceous material leaving behind an inert absorbable bone scaffolding upon which revascularization, osteoblasts migration, and woven bone formation supposedly occurs. Platelet-Rich fibrin (PRF) described by Choukroun et al. is a second-generation platelet concentrate which allows one to obtain fibrin membranes enriched with platelets and growth factors. As compared to platelet-rich plasma, it is easy to obtain and apply, no use of bovine thrombin or anticoagulant is needed, no inflammatory processes are activated, and is relatively cheaper. These advantages have made its use popular among the medical entities. In this case, regenerative periapical surgery has been attempted using PRF to overcome the disadvantages of unreliable repair and to achieve optimal healing.

2. Case report -
A 25-year-old female patient reported to the Department of Conservative Dentistry and Endodontics, Guru Nanak Institute Of Dental Sciences and Research with the chief complaint of fracture and pain in maxillary anterior region. She gave a history of trauma to her anterior teeth 2 years ago. Medical and dental history were noncontributory. Clinically, there was presence of fracture in #11. Radiographic evaluation revealed a large periapical radiolucency about 1.0 cm in diameter in relation to the apex of tooth #11. On electric pulp testing, #11 were found to be nonvital. Based on clinical and radiographic evidences provisional diagnosis of a periapical cyst was established.

Endodontic treatment included the use of intracanal medicament of calcium hydroxide for 1 week followed by apicoectomy of the tooth and obturation using gutta-percha points (Dentsply) and AH Plus sealer (Dentsply). Patient was unwilling to wait for the prognosis of the long term nonsurgical treatment so surgical procedure was advocated which started with the raising of a labial rectangular full thickness mucoperiosteal flap.

After administration of local anaesthesia Lignox 2% (Lignocaine) (Indoco Remedies Ltd) access cavity preparation was done with no 4-round bur and endo access bur (Dentsply Endo Access Bur (Cutting Head) FG 2. Following the working length estimation with no 15 K file (Mani K-File 25mm Size 15) in #11, a thorough chemo mechanical preparation was performed with ProTaper Universal Rotary Files. The root canals were irrigated with combination of sodium hypochlorite (Hyposol, Prevent Denpro) and saline solution. The canals were dried with sterile paper points.

After the canals were dried, Calcium hydroxide dressing was given and the access cavity was sealed with intermediary restorative material (IRM ZOE Intermediate Restorative Material, Dentsply) . Patient was recalled after 1 week and calcium hydroxide was removed from #11 using copious amount of sodium hypochlorite and saline and final
rinse with EDTA (Glyde File Prep - Syringe Kit Set, Dentsply). Obturation was done followed by post endodontic restoration.

A periodontal surgery was planned after one month of the completion of the endodontic treatment. Routine blood investigations were advised for which the reports were found to be normal. After administration of local anaesthesia Lignox 2% (Lignocaine) (Indoco Remedies Ltd) a crevicular incision was given covering 11, 21, 12 and a full thickness mucoperiosteal flap was raised with the help of Howarth periosteal elevator. A bony window was made labially with no 8 round bar and copious irrigation was done followed by curettage of the lining of the lesion.

The infected soft bone was removed and a continuous apicomarginal defect was seen along with buccal wall dehiscence. Later, 3 mm of root was resected with the help of Ultrasonic Tip and 3 mm of gutta percha was removed from the apex with a heated probe. Then retrograde filling was done with white mineral trioxide aggregate (MTA) (ProRoot, Dentsply).

Then placement of the regenerative biomaterial PRF and bone graft in the bony defect was done. The preparation of PRF was in accordance with the...
protocol developed by Freymiller and Aghaloo(2004) which included the collection of 10 ml blood by venipucturing the antecubital vein in a sterile test tube without an anticoagulant and centrifuging it at 3000 rpm for 10min. The product obtained was a structured fibrin clot in the middle of the tube, the red blood corpuscles at the bottom and acellular plasma (platelet-poor plasma) at the top. This PRF was easily separated with a pair of sterile tweezers from the red blood cells after removing the platelet- poor plasma.

A GTR membrane (Periocol) was then placed over the lesion. The flap was repositioned and sutured with 4-0 silk suture with a reverse cutting needle 3/8. Immediate Post-Operative Radiograph (IOPAR) was advised. A perio pack was then mixed and placed over the sutured area so that the repositioned flap remains immobile till healing ensued.

The platelet rich fibrin clot was placed inside the periapical defect. A xenograft was then placed over the periapical defect and also the entire root length devoid of bone.
Postoperatively, antibiotics like Augmentin (combination of amoxicillin and clavulanate potassium) 625 mg tablet every 8 hourly for 5 days and anti-inflammatory drug, i.e., Enzoflam (combination of diclofenac, paracetamol [acetaminophen], and serratiopeptidase) 8 hourly for 3 days was prescribed. After 7 days, the pack was removed along with the sutures and the healing was found to be uneventful. The patient was kept on a follow-up for 1, 3, and 6 months. Six-months follow-up radiograph showed satisfactory bone fill in the periapical area of #11. Crown reduction was done and elastomeric impression was taken. All ceramic crown was fabricated and cemented with Type I Luting GIC.

3. Discussion-
Complete periapical repair and regeneration are the successful outcome of endodontic therapy. Most of the cases with periapical lesions heal satisfactorily with nonsurgical therapy. However, a small number of cases where infection and symptoms persist after non surgical treatment, surgical endodontics is carried out to promote healing. The goal of periapical surgery is to remove all necrotic tissues from the surgical site to completely seal the entire root canal system, and to facilitate the regeneration of hard and soft tissues including the formation of a new attachment apparatus. Regeneration is defined as reproduction or reconstitution of a lost or injured part which fully restores the architecture or function of the part. Regeneration of tissue after periapical surgery 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

(c) Local environmental factors like adhesion molecules, extra cellular matrix and non-collagenous protein molecules. Lack of any of these elements would result in repair rather than regeneration.

From the middle of 20th century, research regarding the use of growth factors from platelets started. PRF is widely used to promote hard and soft tissue healing. Many immunity and healing promoters are present in PRF. It is nothing more than centrifuged blood that requires neither anticoagulant nor bovine thrombin (nor any other gelling agent) for its functioning. It polymerizes naturally and slowly during centrifugation; hence, physiological thrombin concentrates are achieved.

PRF is a fibrin clot charged with serum and platelets which can be obtained by adhering to the protocols used for PRF formation. Some authors believed that PRF functions as a “biologic connector” hence recommended the use of graft particles with PRF where the PRF would function to promote neoangiogenesis, trap the stem cells, and migrate them to the centre of the graft. Marx et al. in their study added PRP to bone grafts used in mandibular bone defects and showed that radiographically the maturation rate was better than that of grafts without platelet-rich plasma.

Perhaps the most commonly used technique for regeneration is the use of bone replacement grafts. These grafts can promote tissue or bone regeneration through variety of mechanisms. Bone grafting materials include autografts, allograft, xenografts, and alloplasts. Alloplasts such as osteoconductive calcium phosphate have been widely used in periapical surgery to enhance new bone formation.

Also here, using the Guided Tissue Regeneration (GTR) membrane technique, combined with bone graft, gave clinically successful result after a 1 year Followup period. The role of bone graft in the above case was for making space and also for inducing bone formation and attachment gain. The rationale for using GTR barrier membranes

![Figure15- Crown reduction done.](image15.png)

![Figure16- All ceramic E max crown cemented on #11.](image16.png)
in above case with bone grafting materials is to encourage the growth of surrounding tissues, while excluding unwanted cell types such as epithelial cells\(^9\). From clinical and radiographic findings, the result of this combined technique was quite impressive, resulting in a significant reduction of probing depth and bone fill. The 6 months follow-up of the patients radiograph shows adequate healing periapically concluding the use of PRF as a healing biomaterial and its success in promoting regeneration of the soft and hard tissues. Long-term follow-up is essential to evaluate the outcome of the treatment.

4. Conclusion -
A careful preoperative diagnosis, appropriate case selection and knowledge of the factors that can negatively affect regeneration outcomes can help to optimize successful regenerative attempts. Treatment strategies used in this case report suggests that combined endoperio lesions can be successfully managed with multiple regenerative procedures.

5. References-
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