



Case Report

# Surgical and Aesthetic Management of Guided Bone Regeneration – A Case Report

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## Abstract

Traumatic injuries to the teeth when left untreated lead to development of apical periodontitis and might harbour microorganisms due to pulpal necrosis. The sequelae might continue and lead to infected periapical cyst. This case report describes the treatment for cystic lesions and also highlights platelet rich fibrin, bone graft and guided tissue regeneration for restoring the lost structure. Following a period of 8 months showed a satisfactory bone fill and favoured excellent prognosis.

**Keywords:** Bone graft; Guided Tissue Regeneration; Microorganism; Platelet Rich Fibrin.

## INTRODUCTION

Microorganisms and its virulence factor play a decisive role in the development of periapical lesions [1-3]. Untreated traumatic injuries to anterior teeth in most of the conditions may lead to apical periodontitis [4-6]. In such a situation where the pulp gets necrosed favours the microorganism to colonise the root canal system and cause inflammation to periapical tissues [7,8]. Infected cystic lesions that are exudative in nature become strenuous to regress only with non-surgical management; in that case it warrants surgical approach [9-11].

There occurs a constant interaction between the host immune response and the microorganisms. When the microbial attack exceeds the body's defensive mechanism, the lesion becomes difficult to undergo self-healing [12,13]. It is very important to diagnose whether the lesion is cystic or granulomatous [14].

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Usually, granulomatous lesions resolve following endodontic treatment [15]. Three-dimensional disinfection of the root canal system is mandatory to attain a favourable prognosis [16]. When it comes to cystic lesions, reports have shown that as the size of the lesion increases (>200mm<sup>2</sup>) there is increased chances of it being a cystic lesion [17,18] although histopathological examination provides a definitive diagnosis [19,20].

This case report aims to manage a large infected periapical cyst through a regenerative means of surgical approach with the combined use of platelet rich fibrin, Bone graft along with guided tissue regeneration. By regeneration means, the authors of this case report intend to restore the lost structures. The novelty in the present case report is that to date there is no case report in literature the uses combined benefits of PRF and Osseo graft (xenograft) for the bone defect in endodontic surgery that accelerated the period of healing process and favoured the prognosis of the treatment. This report also highlights the ease of procuring the PRF and also its advantage in the healing of the periapical tissues.

## CASE REPORT

A 24-year-old female reported with the chief complaint of pain, swelling and pus discharge in the upper anterior right quadrant. History revealed the patient had met with a trauma which was 9 years ago in the same region. Non-contributory medical history. Clinical examination revealed tenderness on percussion in 21,22,23,24. On examination of swelling, there was pus discharge and draining sinus in relation to apex of 22 (Figure 1). In the present case report, a pulse oximeter with the customized sensor holder probe was used to assess the pulpal status. The results of pulp vascularity test revealed decreased oxygen saturation level than the normal levels (<60 spo<sub>2</sub>). Periapical radiograph revealed well defined radiolucency surrounded by sclerotic border in relation to 21,22,23,24 (Figure 2). Pocket formation was evident in 22,23. Based on the clinical and radiographic examination, a provisional diagnosis was made as infected periapical cyst.

Root canal treatment was performed in 21,22,23,24 (Figure 3). Intracanal calcium hydroxide dressing was replaced thrice. During the treatment procedure standard irrigation regimen was followed [21]. Obturation was completed using Bioceramic BC sealer. As the symptoms did not resolve and the treatment did not show a successful outcome, surgical management was decided. Patient consent was taken after careful explanation of the surgical procedure used and the risks and benefits. Before performing the surgery, patients complete hemogram investigation was taken and the results were found to be within normal limits.

Periapical surgery was performed under aseptic conditions, local anesthesia was administered. Submarginal incision was placed and full thickness mucoperiosteal flap was raised. Cyst enucleation was done (Figure 4) and was sent for histopathological examination, following that complete debridement of the defect was done. Root end resection was performed at 0-degree bevel angle upto 3mm in order to include apical ramification and lateral canals, following which root end preparation was carried out using ultrasonic tips. Class 1 cavity of at least 3 mm into the root dentine with parallel walls. All the isthmus tissue which was present was removed and the retro cavity was then filled with bioactive root end filling material (Figure 5).

PRF was collected using an 18-gauge needle, 10ml of blood was withdrawn from the patient. The whole blood was immediately transferred to the test tube that did not contain anticoagulant and was centrifuged at 3000 rpm for 10 minutes. The resultant PRF clot was then formed and collected. Demineralized Bone Matrix (Osseo graft) [Encoll, Fremont, CA, USA] with the particle size of 250 micron particle size was mixed with PRF and was packed into the defect (Figure 6), over which bioresorbable Guided tissue regeneration membrane type 1 collagen was placed (healiguide). The flap was repositioned and sutured with 3-0 back silk suture.

The provisional diagnosis was confirmed on histopathological examination. Patient was recalled after 1 month, 6, 8,10 months and 1 year. During the recall period patient did report signs and symptoms of pain, discomfort or inflammation (Figure 7). After a period of one year, the radiograph showed satisfactory bone formation (Figure 8).



Figure 1- Pre-Operative



Figure 2- Pre-Operative Radiograph



Figure 3- Root Canal Treatment



Figure 4- Cyst Enucleation

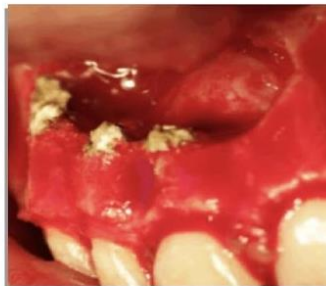


Figure 5- Retrograde Filling

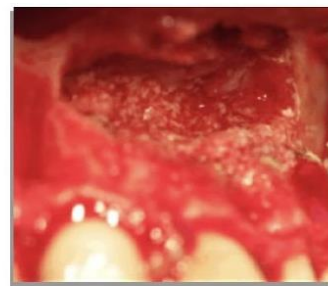


Figure 6- Bone Graft with PRF



Figure 7- Post Operative Clinical After 1 Year



Figure 8- Post Operative radiograph After 1 Year

## DISCUSSION

There are various factors which determine the indication of surgical management. The size of the lesion alone does not play a role in determining the necessity of the surgical approach. To arrive at an appropriate treatment plan, accurate diagnosis of its origin is utmost important. In the present case report, initially a non-

surgical treatment approach was executed according to protocol proposed by Bhaskar et al. [15] but the pathology failed to resolve and the infection was persistent. This is because the cystic lesion was involving apical foramen which was covered by an intact epithelium.

In recent years, the regenerative potential of platelets has been under investigation in the literature. As we know that platelets contain growth factors which leads to formation of cell mitosis and thereby eventually leading to wound healing. There are numerous benefits of using platelet concentrates, it is autologous, relatively easy to procure in dental setting and contains growth factors such as transforming growth factor-beta (TGF-beta), vascular endothelial growth factor (VEGF), and platelet-derived growth factor (PDGF).

PRF is second generation platelet concentrate. It is a fibrin matrix that contains cytokines and platelets. The growth factors of these platelet concentrates get released within the fibrin matrix which favours differentiation, proliferation and cell migration. The cytoplasm contains alpha granules, peroxisomes, lysosomes and mitochondria. Out of which 15% constitutes alpha granules which is said to play an important role in healing process and repair as it contains platelet specific and non-platelet specific proteins, ADP, ATP, serotonin and calcium.

Upon the discussion about the fibrin matrix, it has various functions and it aids in the therapeutic success of PRF. The fibrin mesh matrix of PRF is flexible, strong in nature that facilitates the cytokine and also promotes migration of cells. It acts as a scaffold, eventually aiding in the differentiation of undifferentiated mesenchymal stem cells thereby helping in promoting regeneration. Though there is no substantial justification for the direct interaction between fibrin and the osseous tissue, previous study has reported that fibrin acts a scaffold for the Bone Morphogenetic Protein (BMP) and in turn helps it to constantly release eventually leading to formation of bone. It also plays an important role in angiogenesis and also regulates colonisation by macrophages.

Choukroun et al, proposed the protocol for the preparation of PRF which does not require complex procedures. The equipment includes a table centrifuge, test tube without anticoagulants and other blood collection armamentarium. Once the blood has been collected from the patient it has to be immediately transferred to the test tube without anticoagulants and begins to coagulate rapidly and transform into fibrin network as the efficiency of PRF depends on the speed of the above-mentioned process. If there is any sought of delay during this procedure it may lead to failure in polymerization and the blood clot begins to happen without a consistency [7]. Therefore, it is necessary to follow protocol, so that progressive polymerization begins to take place by incorporating the cytokines into the fibrin mesh matrix. It also increases the lifespan of cytokines and promotes remodeling. Once the clot has been obtained after centrifugation, the RBC is discarded and the PRF clot is obtained.

PRF has numerous advantages over first-generation platelet concentrates. The fibrin mesh obtained from PRP is rigid in nature which does not facilitate the ease of cell migration and does not act as a support matrix. It also requires a large amount of blood (450ml) when compared to PRF. The test tube for collection of PRF does not contain anticoagulants. The time required for centrifuging PRF is 10 minutes at 3000 rpm, single stage centrifugation. PRF also does not contain bovine thrombin which prevents the risk of coagulopathies as compared to PRP [8].

In the present case report bioresorbable demineralized bone matrix was mixed along with PRF and was placed in order to accelerate the healing. This type of xenograft composed of type 1 collagen shown to be structurally stable and in due course of time was found to resorb and replaced with new bone. When addressing the root end repair material, in the present case report bioactive root end filling material as it has excellent biological and physical properties.

Kim et al. [10] proposed a classification for the indication of guided tissue regeneration in endodontics. The present case report was categorized under class D, as stated by Kim. Therefore, bone graft and type 1 collagen bioresorbable membrane was placed in order to enhance the regeneration of bone defect

Previous literature on this perspective was extensively reviewed, Alnemer et al.[21] used only bone graft for the bone defect which showed successful healing after 2 years. There is no single factor that is responsible for the success and prognosis of the treatment, it's multifactorial [22-24]. In the above-mentioned case, the size of the lesion is comparatively smaller than the present case report where the size of the lesion is larger. In another study by Pradeep et al.[22] hydroxyapatite crystals were used as bone graft which was mixed along with PRF to fill the bone defect. After a follow up of one year, it showed significant bone formation. In the present case report, the patient was recalled after every 2 months from the 6 months to 1 year to assess the healing rate and bone formation which showed significant bone formation.

## CONCLUSION

This case report highlights the benefits and combined usage of platelet concentrate along with bone graft in the management of infected large periapical cyst.

**Conflict of Interests:** Nil

**Source of funding:** Nil

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