

# Regeneration of Periapical Bone in Surgical Endodontics: A Case Report

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**Abstract:-** One of the most prevalent types of cysts in the oral cavity are radicular cysts. They are usually caused by trauma or an infectious condition, and they enlarge to cause periapical bone resorption. To enhance post-operative condition and hasten the healing and regeneration process at the affected site, a number of therapy approaches have recently been implemented. After examinations, it was determined that the 22-year-old patient had a radicular cyst, which was initially treated by endodontic treatment of the affected teeth followed by enucleation of the cyst. The patient's primary complaint was swelling and discharge from the maxillary anterior region for the past two months. With the affected teeth, an apicoectomy was carried out. In order to restore function and aesthetic rehabilitation, PRF with DFDBA and a collagen membrane were inserted.

**Keywords:-** Radicular cyst, Apicoectomy, Bone graft, PRF, Collagen membrane.

## I. INTRODUCTION

Prevention is better than cure. It is even more noticeable in dentistry. It is desirable to preserve a tooth rather than replace it. With the improved knowledge and education, patients has started preferring preservation over prosthetic replacement.<sup>1</sup> Orthograde techniques are utilised in regular endodontics, but retrograde filling or endodontic surgery is preferable if there is a persistent and resistant infection.<sup>2</sup> The periapical tissues can regenerate or heal themselves.<sup>3</sup> New tissue does the repair, and the original cells perform the regeneration. The ideal technique is regeneration since it allows the old tissue to regain its periapical tissue's functionality.<sup>2</sup> However, regeneration is difficult to

achieve. For teeth with periapical diseases, numerous methods have been used to induce apical tissue regeneration. Grafts (bone), autologous platelet concentrates, barriers that act to prevent the growth of new tissue, and other materials are commonly used in regenerative methods.<sup>4</sup> Periodontics, endodontics, and implant surgery all use regenerative procedures. Recently, it has been claimed that some materials can regenerate more effectively than endodontic surgery repairs.

The idea behind regenerative therapy is to use bone grafts that have the potential to stimulate bone formation and that allows cellular regrowth in defects caused by pathosis or surgical trauma.<sup>5</sup> Various studies have shown that this regenerative technique can also be used successfully in endodontic surgery because these materials act as a reservoir and matrix for the deposition of new bone.<sup>6</sup> This paper reports a special case of radicular cyst in which Decalcified freeze-dried bone allograft (DFDBA), Platelet Rich Fibrin (PRF) and collagen barrier was used for regeneration of periapical bone after the root canal treatment of involved teeth followed by surgical cystic enucleation and apicoectomy.

## II. CASE REPORT

A 22 years old male patient reported to the department of conservative dentistry and endodontics with complain of fractured upper central incisor. History revealed that he had a fall 10 year back that resulted in fracture of upper front tooth. Intraoral examination showed Ellis class III fracture with 11. There was no pain on percussion or tenderness present in the periapical region. Grade 1 mobility was present with 11 and 12. A non-vital response was elicited from 11 and 12 on using thermal and electric pulp tester.

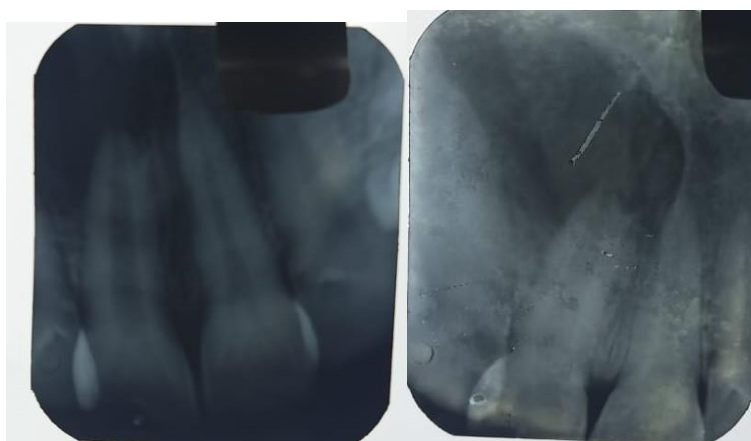


Fig. 1: IOPA before endodontic treatment



Fig. 2: CBCT scan after endodontic treatment and before surgical enucleation



Fig. 3: After endodontic treatment and before surgical cystic enucleation

A intraoral periapical radiograph revealed an oval shaped periapical radiolucency about 1\*1cm with clear cut borders involving the periapical region of 11,12. The case was diagnosed as infected periapical cyst related to 11,12. Root canal treatment was initiated with 11,12. Patient was further referred to the department of Oral and Maxillofacial surgery for planning apicectomy with proper regeneration with bone graft.

A Cone beam computed tomography was done to visualize the actual extent of the cyst. It revealed periapical cyst involving 11, 12 and extending upto mesial root of 13 and 21. It also revealed that cystic is extending superiorly upto floor of nasal cavity. After the CBCT interpretation, endodontic treatment was initiated with 13 and 21.

Routine blood investigations were carried out and oral prophylaxis was carried out. Oral prophylactic antimicrobial therapy was initiated with Tab. Augmentin 625 mg twice daily one day prior to the surgery. Under proper aseptic protocols and local anaesthesia, a trapezoidal mucoperiosteal flap was raised using vestibular incision extending from 13 crossing midline till 21 region with vertical releasing incisions on distal aspect of 13 and 21. Loss of buccal cortical plate was seen with 11, 12. This defect seen in buccal cortical plate was slightly enlarged with a round bur. Complete curettage was carried out in the defect and all of the cystic lining was removed successfully. After the thorough curettage of the granulomatous tissue, copious irrigation was carried out with betadine solution. Meanwhile, 5 ml blood was withdrawn from the forearm of the patient for the preparation of PRF. The collected blood were placed in vacutainer tubes and then placed in centrifugal machine at 3000 rpm for 15 minutes.



Fig. 4: Pre-operative Intraoral



Fig. 5: Full thickness mucoperiosteal flap raised



Fig. 6: Radicular cyst enucleated



Fig.7: Apicoectomy done with retrograde filling with MTA



Fig. 8: DFDBA



Fig. 9: Platelet Rich Fibrin (PRF)



Fig. 10: Bone graft with PRF placed in defect



Fig. 11: Collagen Membrane Placed



Fig. 12: Suturing done with 3-0 Mersilk Suture

Retrograde obturation of the root canal was done with MTA after achieving proper haemostasis and isolation of the surgical site. The prepared PRF was removed from the vacutainer and directly mixed with the Freeze dried irradiated bone granules that is DFDBA. DFDBA mixed with PRF was packed in the bony defect. A collagen membrane was placed over this site for guided tissue regeneration, the flap re-approximated and sutured with 3-0 mersilk sutures by interrupted suturing techniques. Post-operative instructions

were explained to the patient and antimicrobial therapy was continued with Tab. Augmentin 625 mg twice daily for five days. Patient was recalled after 7 days for suture removal and follow up. Satisfactory post-operative healing was seen without any appreciable complications and sutures were removed. Clinically at the end of 1<sup>st</sup> month the mobility of 11 and 12 has reduced and at the end of 3<sup>rd</sup> month the mobility in both teeth completely disappeared.

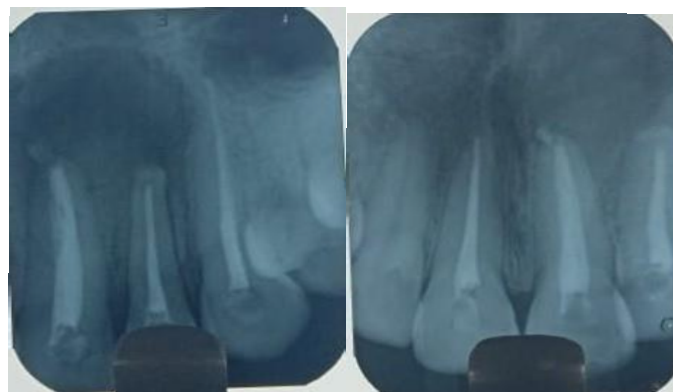


Fig. 13: 1 month post-operative IOPA



Fig. 14: 3 month post-operative IOPA



Fig. 15: Pre-operative and 3 month post-operative occlusal Radiograph

Radiographic evaluation was done with with Intraoral Periapical radiograph and occlusal radiographs at end of 1<sup>st</sup> and 3<sup>rd</sup> month postoperatively. Increasing levels of radiopacity was demonstrated at subsequent radiographic evaluation, indicating successful uptake of the graft and positive bone regeneration. 1<sup>st</sup> month post-operative radiograph showed increased radiopacity of the material within the bony defect. 3<sup>rd</sup> month post-operative radiograph showed a diffuse radiopaque area and increased calcification surrounding the graft.

### III. DISCUSSION

Radicular cysts form as a result of inflammation in the periodontal ligament, usually after the death of dental pulp. The prevalence of maxillary odontogenic cysts is more than three times that of the mandible. A cyst's pathogenesis begins with initiation and progresses to cyst formation before enlarging to involve nearby bone and other vital structures. Toxins from necrotic pulp enter the tooth at the apex, causing periapical inflammation.<sup>7</sup> Treatment options for radicular cyst is endodontic treatment of involved tooth followed by cystic enucleation and marsupialization.<sup>8</sup>

The postoperative process is divided into two stages: regeneration and repair. Regeneration is defined as the reproduction or reconstitution of a nearly or injured part in order to restore the architecture and function of the periodontium.<sup>9</sup> Growth factors and bone grafts make it possible.

The concept of platelet gel therapy has been transformed by platelet rich factor. Platelet rich fibrin (PRF) is a fibrin matrix that traps platelet cytokines, growth factors, and cells and can act as a resorbable membrane. Autologous PRF is thought to be a healing biomaterial. Recent research has shown that it can be used in a variety of dental disciplines.<sup>10</sup> Ross et al. introduced platelets regenerative potentiality and described a platelet-derived growth factor. Growth factors are released and stimulate the mitogenic response in the bone periosteum during normal wound healing after activation of the platelets trapped within the fibrin matrix. Since the last two decades, a better understanding of the physiologic properties of platelets in wound healing has led to an increase in its therapeutic

applications in various forms, with varying results.<sup>11</sup> PRF has several advantages, including the fact that no biochemical handling of blood is required, and it is also cost effective. Slow polymerization observed during PRF processing results in platelet cytokines and organic chains being incorporated into the fibrin mesh, resulting in efficient cell migration. This discovery implies that, unlike other platelet concentrations, PRF can release more cytokines during fibrin matrix remodelling. This mechanism could explain PRF's clinically observed healing properties. PRF has anti-inflammatory properties in the immune system.<sup>12,13</sup> There are numerous types of bone grafts used for regeneration, including auto genous grafts, allogeneic grafts, alloplastic grafts, and xenogeneic grafts. Many bone grafts are available for osteoinduction, osteoconduction, and osteoproliferation. Bone grafts are unlikely to promote adequate periapical wound healing in the absence of a blood clot or angiogenic factors. PRF can be combined with bone grafts in the form of a platelet gel.<sup>7</sup> PRF with bone graft has the added benefits of graft stabilisation, wound sealing, haemostasis, and improved handling properties in addition to promoting wound healing, bone growth, and maturation.<sup>9</sup> The success of spontaneous bone healing is directly related to the size of bony defects, anatomical location, patient age, and other factors. Many studies advocated for the use of bone grafts to fill the remaining cystic cavities.<sup>14</sup>

Barrier membranes have been widely used to treat periodontal and other soft tissue defects. Numerous studies have shown that preventing epithelial cell migration into the bone defect promotes superior bone regeneration by allowing osteoprogenitor cells and biologic growth factors to repopulate the defect.<sup>15</sup> Dahlin et al. demonstrated in their study that when a membrane isolates an area while maintaining contact with the surrounding bone, it only allows cells from the surrounding bone and bone marrow to migrate into the defect while protecting it from soft tissue ingrowth. Membranes are classified into several types based on their ability to withstand pressure and the material used to create them. The use of a membrane after a cystic enucleation helps to isolate and maintain space, preventing tissue ingrowth into the defect and wound contamination. When used inconjunction with particulate graft material, a membrane can help prevent graft particle migration. Studies have shown that

using a collagen membrane increases bone formation and decreases alveolar dimensional changes in healing in bony defects compared to sockets that did not use a membrane.<sup>16</sup>

Thus, the current case demonstrates the benefit of platelet-rich fibrin (PRF) and bone grafting when combined with a collagen membrane. It demonstrated good clinical and radiographic healing signs, which may contribute to the successful treatment of such cases. However, additional clinical trials should be conducted to address the use of these materials.

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