

Management of Periapical Cyst Using Beta Tricalcium Phosphate Bone Substitute and Platelet Rich Fibrin Membrane Following Enucleation

Abstract:

The pulp and periodontium are connected anatomically, functionally, and developmentally. It might be challenging to diagnose and arrange effective treatments when pulpal issues and inflammatory periodontal disease coexist. One of the most frequent oral cavity cysts is the radicular cyst, which is typically brought on by trauma or an infection. There are a number of techniques that are now being used to enhance postoperative recovery and hasten the repair and regeneration of the damaged area. An investigation revealed that a 38-years-old patient had a radicular cyst, which was initially treated by endodontic treatment of the involved teeth, followed by enucleation of the cyst and a further bone graft placement followed by Platelet rich fibrin membrane. The patient's main complaint was pain in lower front jaw region for two to three months. Patient also had few episodes of pus discharge on its own through the same region. After three months, there was an increase in clinical attachment level and a decrease in probing depth. There was a sizable bone fill, according to radiographic findings.

Key-words: Periapical cyst, Platelet Rich Fibrin membrane, Beta tricalcium phosphate

Introduction:

Simring and Goldberg initially identified the link between periodontal and pulpal disease in 1964.[1] Endoperio lesion caused by inflammatory products that are present in the pulpal tissues and periodontium to variable degrees. Due to the strong connection between the Endodontium and Periodontium, disease of one tissue may involve the other.

Endodontic and periodontal diseases have a variety of pathogeneses and are complex in nature. The diagnosis of the particular condition determines the majority of the treatment, decision-making, and prognosis. The patient must be referred to several areas of specialisation for restorative, endodontic, and periodontal care, either separately or in combination, in order to have the best prognosis.

Classification:

According to Simon, Glick and Frank in 1972 classified as[2]

1. Primary endodontic lesion

2. Primary periodontal lesion
3. Primary endodontic lesion with secondary periodontal involvement
4. Primary periodontal lesion with secondary endodontic involvement

True combined lesion

Case Report:

A 38 years old male patient came to the department of periodontics with a chief complaint of pain in lower front jaw region since 3 months. Patient also gave history of few

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episodes of pus discharge following the swelling in the labial mucosa and gingiva. On intra oral examination severe attrition of teeth, subgingival calculus, and deep periodontal pockets in relation to 31 32 and 41 were seen. Diffuse gingival swelling with exudation through the sulcus was also present on examination. Electric thermal pulp vitality testing showed negative response in 31 32 and 41. Radiographic findings showed radiolucency in apical region of the teeth in relation to 31 and 41. Patient was systemically healthy.

Diagnosis:

Primary endodontic with secondary periodontal lesion in relation to 31 32 and 41 (According to Simon *et al*, 1972).

Decision making and treatment plan

Decision making:

Pulpal Involvement should be treated with endodontic therapy (Rotstein *et al*, 2002) [3] after the phase I therapy. The evaluation of treatment results after 1 month and further periodontal therapy should be considered (Parolia *et al*, 2013).

Treatment Plan:

Phase I: Scaling and root planning ; Oral hygiene instructions.

Evaluation of Phase I after 1 week.

Phase II: Biomechanical preparation and obturation in relation to 31 32 41. Open flap debridement with enucleation of cystic lesion and regeneration for bone loss in relation to 31 41.

Phase IV: Maintenance and recall.

In the current case, periodontal therapy was planned due to presence of deep periodontal pockets and diffuse gingival swelling with exudation (fig.1B). Phase I therapy was started. After a week, the patient was recalled back for an oral hygiene assessment. For 31 32 and 41, endodontic therapy was done. Periodontal pocket was re-evaluated after 4 weeks. In relation to 31 32 and 41, deep periodontal pockets measuring more than 5mm was anticipated. Periodontal flap surgery was scheduled. Following the administration of an adequate dose of local anaesthesia, a full thickness mucoperiosteal flap was raised by making crevicular incisions in relation to teeth 31 32 41 and vertical releasing incisions at the distal line angle 32 and mesial line angle of 42 that extended into the alveolar mucosa (fig.3). Gracey curettes were used to completely debride the region. A round mass of approximately 12mm was present in association with 31 (fig.3D). Enucleation of cystic

lesion and complete debridement was done (fig.3E). After being acquired, the material was grossly examined for histological analysis, which revealed characteristics suggestive of radicular cysts (fig.6).

Bone graft was placed to the bony space followed by placement of prf-membrane (fig.5 J,K). The placement of simple interrupted silk sutures was done (fig.5L). After receiving post-operative prescription drugs and instructions, the patient was recalled back for suture removal one week later.

Preparation of Prf Membrane:

Two sterile, 4 ml-capacity vacutainer tubes were used to collect nearly 10 ml of whole venous blood without the use of an anticoagulant (fig.4F). Then, for 10 minutes, the vacutainer tubes were spun at a speed of 3000 revolutions per minute (rpm) in a centrifugal machine (fig.4G). The layers of collected blood that formed after centrifugation were as follows: upper straw-colored cellular plasma, middle fraction containing the fibrin clot, and bottom red fraction containing red blood cells. The intermediate fraction, also known as PRF, was collected 2 mm below the bottom dividing line after the upper straw-colored layer was removed (Fig 4H). The intermediate fraction containing prf was kept in between two gauge pieces and squeezed gently to obtain prf-membrane (fig.4I).

FOLLOWING 3 MONTHS OF SURGERY, the patient was recalled back for another clinical and radiological evaluation. The patient's proper dental hygiene was encouraged. On probing, there was no bleeding and exudation in regard to 31 32 41. The inflammation subsided (fig.7O), and the depth of the probing pocket decreased. Following surgery, IOPA revealed bone fill in respect to 31,32,41 (fig.7P).

When the patient was evaluated three months later, the radiograph revealed enhanced radiopacity in comparison to the earlier radiographs and a good amount of regeneration. Repair at the injury site was also noted and was noted to be amenable to PRF and bone graft use.

Discussion:

The diagnosis and prognosis of teeth with endo-perio lesions is a challenge to clinicians. Correct diagnosis is crucial for determining the course of treatment and long-term outlook. However, one of the most frequent difficulties in modern

clinical practise is treating a complex endodontic periodontal disease. The diagnosis may be made more difficult and the prognosis of the afflicted teeth may be impacted if pulpal and periodontal tissue deterioration are present at the same time[4]. This emphasises how crucial it is to follow a key diagnostic strategy to guarantee an appropriate treatment plan. Additionally, a full grasp of the two complicated tissues involved in the wound healing process is necessary[5]. Endodontic treatment and periodontal regeneration treatment are both necessary for the treatment of endo-perio lesions.

A proper endodontic therapy would typically result in healing of the endodontic component in a case with mixed endo-perio lesions, and the prognosis would ultimately depend on the success of the periodontal repair or regeneration initiated by any of the treatment methods[6].

Radicular cysts are those that form as a result of inflammation, typically after non-vitality of tooth pulp, from epithelial remnants in the periodontal ligament. They are the most typical odontogenic cyst that affects the maxilla, which is larger than the mandible by three times. The pathogenesis of a cyst starts with initiation, advances to cyst development over time, and eventually enlarges to encompass the surrounding bone and other essential structures. Toxins from the necrotic pulp emerge at the tooth apex in this area, causing periapical inflammation[7]. The cyst can be treated in a number of ways, including endodontic therapy, followed by enucleation and marsupialization [8].

Choukroun's PRF can offer a potential new bone in a variety of bone repair operations. In a case series through a radiological and histological evaluation after six months following the surgery, Mazor et al. reported that use of PRF as the sole filling material during a simultaneous sinus lift and implantation procedure had stabilised a good amount of regenerated bone in the subsinus cavity up to the tip of implants[9]. Additionally, they recommended Choukroun's PRF, a straightforward and affordable biomaterial that is routinely used during a sinus lift, as a viable option[10]. According to Ellegaard et al., Nielsen et al., and other researchers, osteoinduction, osteoconduction, and osteoproliferation are all performed by bone grafts

Early research and clinical experience suggest that PRF enhances early wound closure, bone maturation, and the periodontal soft tissues' final aesthetic appearance. An excellent scaffold for use in tissue healing can be created by

producing a thick, cross-linked, physically strong PRF using intact platelets and fibrin during high-speed centrifugation in the absence of exogenous thrombin[11]. After periapical surgery, total healing takes around a year to occur; however, with PRF, recovery is sped up and complete bone regeneration takes only six months[12]. New opportunities for improved healing and functional recovery are presented by the use of autologous platelet-rich fibrin in conjunction with bone graft. It might be more cost-efficient and effective than any other regeneration materials now in the market.

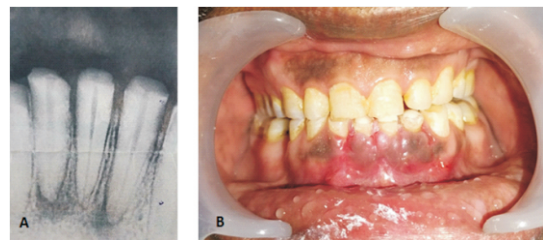


Fig 1- Pre Treatment Radiograph (iopar) And Intraoral Picture
A: Periapical radiograph of the patient (pre-treatment) showing localised radiolucent lesion (with dense cortical border) in respect to the 31 and diffused radiolucent lesion with flecks of radio opacity in respect to 32 and 41. B: Intraoral picture (pre-treatment) showing diffused swelling in the mandibular anterior region. Gingival margin is coronal to CEJ.



Fig 2- Incision Line

C: Crevicular incision was given extending from the distal aspect of 41 to the mesial aspect of 33. Vertical excision was also given mesial to 33 and another mesial to 42, extending up to the mucogingival junction.

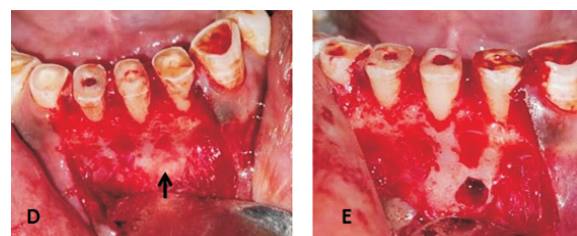


Fig 3- Elevation Of Full Thickness Mucoperiosteal Flap
D: Cystic lesion can be appreciated (arrow) associated with the apical region of 31. E: After enucleation of the lesion and thorough debridement the bone loss was evident.

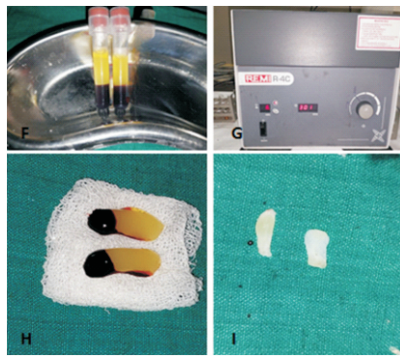


Fig 4- Preparation Of The Prf (platelet Rich Fibrin) Membrane
 F: PRF vials after centrifugation of the patient's blood at 4000 RPM for 10 minutes, G: Centrifuge (Remi R 8 C), H: PRF removed from the vials and kept over saline soaked gauze, I: PRF membrane prepared after pressing the PRF between two gauze pieces.

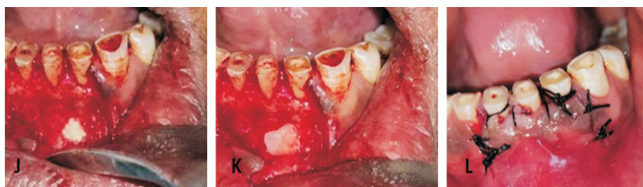


Fig 5- Augmentation Of The Bone Defect Caused By Cystic Lesion

J: The beta tricalcium phosphate bone substitute material was mixed with Doxycycline and saline (3:1:1) and the defect was filled, K: The PRF membrane prepared earlier was placed over it, L: Continuous sling sutures (3-0 silk) were given after repositioning the flap and vertical releasing incision was closed by interrupted sutures (3-0 silk).

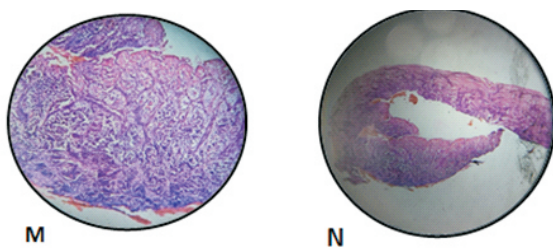


Fig 6 – light microcopy of the soft tissue lining excavated from the lesion

M: At 4X magnification under the light microscope the cystic lining can be appreciated along with fibrous connective tissue the epithelium is of stratified squamous type with variable thickness. N: At 10X magnification A folded section of the cystic lining shows stratification of the epithelium and inflammatory cells (lymphocytes and neutrophils) within the connective tissue are present (Dense inflammation).



Fig 7- 3 Month Post Operative View

O: Intraoral picture taken after 3 months post-surgical phase the inflation has subsided considerably no edema can be seen the colour contour consistency of the gingiva and the alveolar mucosa is of normal appearance. P: The 3 months post surgery IOPAR shows considerable amount of bone fill in the region in respect to 31,32 and 41.

Conclusion:

Endo perio lesions have a complicated pathophysiology, making it difficult to diagnose and effectively treat them. In order to effectively treat the lesion, collaboration across many disciplines, including as prosthodontics, endodontics, and periodontal management, is necessary. As demonstrated in this case report, a better treatment strategy yields better results.

With the help of the current case report, it is confirmed that the combination of PRF and bone transplant resulted in good functional recovery as well as regenerative advantages. It might be more cost-efficient and effective than any other regeneration materials now on the market. Being the affordable, useful, and easily accessible treatment of choice.

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