ISSN : 2350-0743

www.ijramr.com

International Journal of Recent Advances in Multidisciplinary Research
Vol. 05, Issue 04, pp.3787-3792, April, 2018

CASE REPORT

SURGICAL MANAGEMENT OF INFECTED RADICULAR CYST USING PLATELET RICH FIBRIN (PRF), SYNTHETIC BONE GRAFT AND PERIODONTAL MEMBRANE FOR GUIDED BONE REGENERATION: A CASE REPORT

[1,*]Dr. Brijesh Byrappa, [2]Dr. Narahari Ranganatha, [3]Dr. Mohammed Yunus, [4]Dr. Ragesh Raman, [5]Dr. Mamatha, N.S., [6]Dr. Arun, K.P.

[1]Dental Surgeon & Implantologist, Dental Experts – A Super Speciality Dental Clinic, (No. 71, Dr Rajkumar road, Prakash Nagar Bangalore 560021)
[2]Oral & Maxillofacial Surgeon, Senior Lecturer, Dept. of Oral & Maxillofacial Surgery, Rajarajeswari Dental College & Hospital, (No. 14, RAMOHALLI Cross, Mysore Road, Kumbalgodu, Bangalore -560074)
[3]Dental Surgeon & Implantologist, Dental Experts – A Super Speciality Dental Clinic, (No. 71, Dr Rajkumar road, Prakash Nagar, Bangalore 560021)
[4]Oral & Maxillofacial Surgeon, Dental Experts – A Super Speciality Dental Clinic, (No. 71, Dr Rajkumar road, Prakash Nagar, Bangalore 560021)
[5]Oral & Maxillofacial Surgeon, Professor, Dept. of Oral & Maxillofacial Surgery, Rajarajeswari Dental College & Hospital, (No. 14, RAMOHALLI Cross, Mysore Road, Kumbalgodu, Bangalore -560074)
[6]Oral & Maxillofacial Surgeon, Reader, Dept. of Oral & Maxillofacial Surgery, Rajarajeswari Dental College & Hospital, (No. 14, RAMOHALLI Cross, Mysore Road, Kumbalgodu, Bangalore -560074)

ARTICLE INFO

Article History:
Received 05th January, 2018
Received in revised form
24th February, 2018
Accepted 10th March, 2018
Published online 30h April, 2018

Keywords:

Radicular Cyst,
Guided Bone Regeneration,
PRF, Periapical Cyst, Apicoectomy,
Enucleation, Bone Graft,
Root End Cyst, Cell Rests of malassez.

ABSTRACT

Radicular cysts are most common asymptomatic lesions of the jaw, it comprises up to 68% of cysts in the region. Large cyst of the jaw necessitate surgical management to obtain bone regeneration and healing of periapical tissues. Use of patients own blood components such as platelet rich fibrin (PRF) to enhance healing is unique concept in oral surgery. Through this case report we would like to illustrate the effectiveness of PRF mixed with synthetic bone substitute for guided bone regeneration in bone defect resulting from a periapical cyst enucleation. The treatment outcome of this case report shows that a combination of synthetic bone graft and PRF is successful in accelerating the physiological healing.

INTRODUCTION

Radicular cyst/ Periapical cyst/ Apical periodontal cyst/ Root end cyst are odontogenic cysts of inflammatory origin. This is the most common cyst in maxillofacial region and usually found at the apices of the involved teeth, however they may also be found on the lateral aspects of the roots in relation to lateral accessory root canals, they arise from stimulation of epithelial remnants of cell rests of malassez in periodontal ligament (Byakod, 2014). The Rests of malassez are remnants of hertwigs root sheath which proliferate when stimulated by inflammatory process that originates from infection or pulp necrosis of a non-vital tooth with the development of a periapical granuloma (Nair *et al.,* 2017). This may be infected or sterile which undergoes epithelium liquefaction necrosis to become a radicular cyst (Rajendran, 2009). They are more common in maxillary than mandibular teeth region. In maxilla, anterior teeth are more prone to the development of periapical cysts due to traumatic injuries, while in the mandible they are more common in the premolar region. Radicular cyst can occur at any age but are seldom seen associated with primary dentition and majority of them are asymptomatic. In rare cases long standing cysts may undergo secondary infection or form a draining sinus. Radiographically it appears as a round or oval radiolucency of variable sizes around apical region of tooth, which is generally well delineated and most likely with a

***Corresponding author:* Dr Brijesh Byrappa,**
Dental Surgeon and Implantologist, Dental Experts, A Super Speciality Dental Clinic, (No. 71, DrRajkumar road, Prakash Nagar, Bangalore 560021).

marked radiopaque rim. Cone beam computer tomography (CBCT) gives a three dimensional extent of the cystic lesion and its proximity to vital structures. Histologically a mature collagenous connective tissue wall with abundant fibroblasts can be seen within the cystic wall. Lymphocytes and plasma cells present as inflammatory infiltrate. Within the cystic wall are erythrocytes, spicules of dystrophic bone, multinucleated giant cells and cholesterol crystals. Treatment consist of extraction of the involved teeth and enucleation of the periapical tissue. Under some conditions, root canal therapy may be carried out with apicoectomy with enucleation of the cystic lesion. The cyst does not reoccur if surgical removal is thorough. If the cystic sac is badly fragmented leaving epithelial remnants or if a periapical granuloma is incompletely removed with epithelial rests remaining, a residual cyst may develop in this area months or even year later. If untreated, the radicular cyst slowly increases in size at the expense of the surrounding bone.

The bone undergoes resorption, but seldom there is a remarkable expansion of the cortical plates.[7] After complete enucleation of the cyst, the cavity is usually filled with blood and forms a clot. Blood clot is a physiological version of Platelet rich fibrin (PRF) and it takes 6 months to 1 year to heal. But when cystic cavity is filled with PRF, Healing phenomenon is accelerated by decreasing three months of normal physiological healing (Mitrea *et al.,* 2015). Hard and soft tissue healing is mediated by a variety of intra and extracellular events. A number of studies from the literature have shown that bone regeneration procedures may be improved by the addition of specific growth factors. Platelet concentrates are used routinely in surgical and medical specialties. The platelets play a crucial role not only in hemostasis but also in wound healing (Mitrea *et al.,* 2015).

CASE REPORT

A 38 year old male patient walked into our clinic with the complaint of mobility of teeth in upper right front region since 2 years. Patient gives a history of orthodontic treatment with all four 1st premolars extraction 12 years back. In the past 2 years patient had experienced 3 episodes of pain associated with swelling and pus discharge in the right upper front tooth region. On the first episode patient did a warm salt water rinse and the pain relieved. During the other two episodes he visited a nearby dentist and he was prescribed a course of antibiotics and analgesics. The symptoms reduced temporarily on consumption of the medication and reoccurred after a time period.

Fig. 1. Preoperative intraoral photograph

Fig. 2. Preoperative OPG

The patient's medical status was noncontributory. On extra oral examination, there was a diffuse swelling in the right middle third of face extended from right corner of the mouth 3cms upward, Medio laterally from ala of the nose 3cms laterally with obliteration of nasolabial fold. The skin over the swelling was normal in color and there was no local rise in temperature. On Intra oral examination grade I mobility of maxillary right central, lateral incisor and grade II mobility of right canine noted. On percussion of 13, 12 there was a dull note suggestive of non-vital teeth. The electronic pulp sensitivity test was negative for both 13, 12 confirming both teeth are non-vital. A chronic sinus tract opening and an erythematous area measuring 0.5cm × 0.5cm was noted in the mucogingival junction of extracted 14 region suggestive of chronic sinus tract. On palpation all the inspectory findings were confirmed and vestibular tenderness was noted in relation to 13 and 12. There was a pus discharge from the chronic sinus tract opening in the mucogingival junction in relation to 13 and 14. Following a orthopantogram (OPG) X-ray examination, Full component of teeth in the maxillary and mandibular arches except for 24 and 44 suggestive previous orthodontic treatment, Root stumps of 14 and 34 were noted suggestive of attempted extraction prior to orthodontic treatment. A large well defined radiolucent area measuring about 1.5cms × 1.5cmswas observed in the periapical region of 13 and retained root stumps of 14, suggestive of Radicular cyst. CBCT view suggested radiolucent lesion in the right side of the maxilla involving 12, 13, 14(root stumps), 15. A large ovoid hypodense lesion with irregular border measuring about 19mm × 13.2mm × 10mm is noted along the periapical region of 13. The lesion extends from the palatal alveolar bone along 12 to the root apex of 14, Mild buccopalatal expansion with thinning of cortices noted. Following the history, clinical and radiological examination the patient was diagnosed with Infected Radicular Cyst involving teeth 12, 13 and 14.

Fig. 3.1 Preoperative CBCT showing the proximity of the radicular cyst to the maxilllary sinus

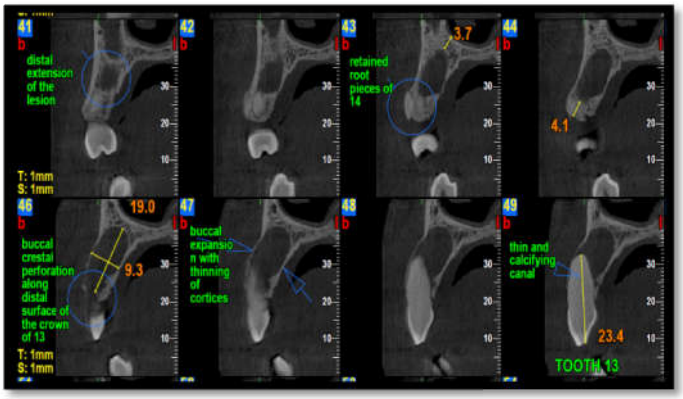

Fig. 3.2. Preoperative CBCT showing the superoinferior extent of the cyst

Fine needle aspiration cytology (FNAC) through the crestal bone perforation distal to 13 was done which resulted in semi viscous reddish yellow aspirate which confirmed infected radicular cyst in relation to 12, 13 and 14.

Fig. 4. Showing semi viscous reddish yellow aspirate

A combination of composite and stainless steel wire splinting was done as the upper right central, lateral incisor were grade I mobility and upper right canine was grade II mobility. Endodontic treatment was performed in upper right canine and lateral incisor as they were non vital. The next step of the treatment was to manage the periapical lesion surgically under local anesthesia. Preoperative routine blood investigation were performed, vitals recorded. Surgical procedure and possible complications informed to the patient and an informed consent was obtained from him. Local anesthetic was administered, crevicular incision and an anterior releasing incision was placed and a full thickness mucoperiosteal flap was raised to access the cystic region.

Extraction of first premolar root stumps was done and thinned cortex over the cyst was removed slowly using surgical burs under copious irrigation with saline solution to create access to the lesion. The cystic lining was identified and slowly separated from the adjacent bone and apicoectomy performed in upper canine, lateral incisor and the cyst was enucleated in total. The bone cavity was irrigated with a mixture of saline and betadine solution and dried, careful clinical examination of the bony defect was performed to verify if there is any residual cystic lining left out.

Fig. 5. Enucleation of the cyst under LA

Fig. 6. Bony defect post enucleation of the cyst

The cyst was placed in 10% formalin solution and sent for histopathological examination for the definitive diagnosis. The remaining bony defect was deep and extended which presented a risk of incomplete bone healing or fibrous invagination. PRF was prepared according to Joseph choukroun et al's protocol using 8ml of venous blood collected from antecubital vein of the patient. On centrifugation resulted in formation three layers: The top later is platelet poor plasma (Acellular Plasma) - PPP, The intermediate layer is platelet rich fibrin (Fibrin clot) - PRF and the deep layer, contain red blood cells- RBC.

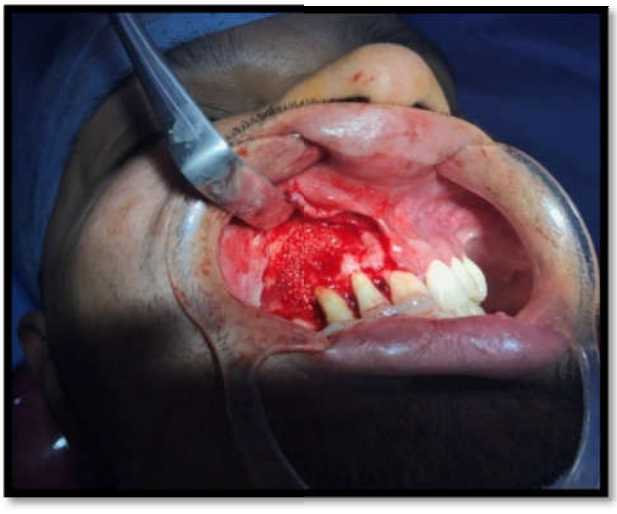

Fig. 7. Synthetic bone grafts and PRF mixed to fill the cystic cavity

Fig. 8. Synthetic bone grafts stabilised usyng perodontal membrane

Fig. 9. Postoperative healing

Fig. 10. Postoperative IOPAR showing RCT, Apicoectomy and bone grafts in the cystic cavity

The PRF layer was separated and it was mixed with commercially available hydroxyapatite(HA) bone graft crystals (Osteon II), together the mixture was packed into the defect site. A sterile collagen periodontal membrane (Pericol-GTR) was adapted over the graft material extending to the interdental areas.

The mucoperiosteal flap was sutured using 4-0 nylon (Ethilon) suture material and periodontal dressing was placed. Antibiotics, analgesics and oral rinse was prescribed for 5 days. At 24 hrs after surgery moderate post-operative edema was noted which gradually decreased over a period of 7 days. The periodontal dressing was removed carefully at 5th day and there was no signs of wound dehiscence or infection in the operated site. Suture removal was done at the end of 10 days. Recall and checkup was done at the end of 1, 3 and 6 months with clinical and radiographic examination.

Post-operative healing was satisfactory and radiographs revealed bone regeneration. Splint was removed after 9 months and there was no mobility of teeth. Histopathology report revealed cyst devoid of lining epithelium and inner surface covered by sheets of foamy histocytes, plasma cells and lymphocytes along with few neutrophils, there was no evidence of granuloma/ malignancy in the section studied and impression was consistent with Radicular Cyst.

Fig. 11. Postoperative OPG showing RCT, Apicoectomy and bone grafts in the cystic cavity

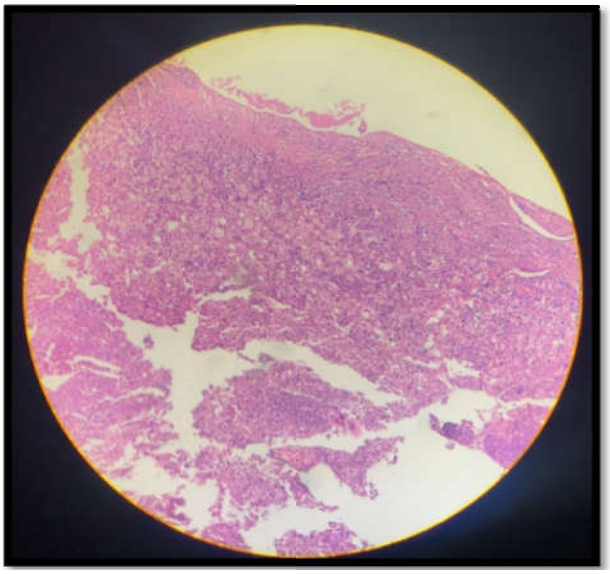

Fig. 12. Histopathological examination

DISCUSSION

Periapical cysts have been described in anterior region of the upper jaw. Some of the possible reasons for such cysts develop in maxilla are: the spongy structure of maxillary bone and the reluctance to extract the anterior teeth which present periapical processes and their prolonged maintenance in the arch leads to the formation of cysts.

The diagnosis and treatment of bone cysts of the jaws, including radicular cysts is very common in oral and maxillofacial surgery (Dudek *et al.,* 2013). There are several treatment options to treat the cysts such as endodontic treatment followed by enucleation or marsupialization (Vidhale *et al.,* 2015). The treatment is dependent on the size and location of the lesion, the bone integrity of the cyst wall and its proximity to vital structure (Byakod *et al.,* 2014). A study done by caliskan et al show's good prognosis of large cyst like lesions treated with non-surgical root canal treatment. In which a total of 42 mature anterior teeth with a large periapical cyst-like lesions ranging in size from 7-18mm in diameter were treated endodontically using calcium hydroxide as the intra canal medicament. All cases were followed up for a period of 2-10 years. Complete healing was observed in 73.8% and incomplete healing in 9.5% of cases. This study suggests that large cyst-like periapical lesions can heal following nonsurgical root canal treatment (Caliskan *et al.,* 2014). The surgical approach of maxillary cystic lesion is marsupialization or total enucleation with apicoectomy post endodontic treatment. Periapical surgery includes removal of damaged tissue and sometimes the application of different grafting material to enhance new bone formation at the remained defect site (Mitrea *et al.,* 2015).

After the removal of cyst, the bone defect will usually get filled with blood. The blood clot contracts during early healing which results in loss of contact between the clot and the wall of the surrounding bone. The formation and in-growth of blood vessels may be disturbed and consequently, oxygen and nutrient supply. Furthermore the blood clot may be destroyed by the fibro lytic activity of bacteria from the oral cavity which may result in wound infection leaving a post resection area of a size similar or larger than the lesion. The unfilled defect can lead to an unaesthetic appearance or even complications such as loss of the resected tooth or fracture of the jaw (Dudek *et al.,* 2013).

In the literature, various treatments are described to avoid such complications and to promote bone regeneration Schulte describes a method in which the blood clot is stabilized with collagen sponges soaked with antibiotics to reduce the contraction of clot. Later this method was modified by using centrifuged blood, the curetted defect may be filled with autogenous bone, which however will cause additional morbidity at the donor site. The use of bone substitutes enables the surgeon to stabilize the clot without graft harvesting. Bone substitute differ in their origin (Allogenic, Xenogeneic or Synthetic) and their behavior in the human body (Resorbable or Non – resorbable). Most bone substitutes are applied in granular form depending on defect size, form and location, securing the material with collagen periodontal membranes is necessary. Generally bone defects resulting from cyst enucleation are multi-walled and not mechanically challenged, thus bone regeneration is reproducible and reliable if appropriate osteoconductive scaffolds are used.[4]There are several bone grafts that are used for the purpose of osteoinduction, osteoconduction and osteoproliferation. Bone graft alone without a blood clot or angiogenic factors are unlikely to promote sufficient periapical wound healing. PRF in the form of a gel can be used in conjunction with bone grafts.[5]Besides promoting wound healing, bone growth and maturation, PRF with bone graft has advantages of graft stabilization, hemostasis and improved handling properties.

The success of spontaneous bone healing is directly related to the size of bony defects, the anatomical location, the patient's age and other parameters. Production of a dense, cross-linked, physically robust PRF made of intact platelets and fibrin by high speed centrifugation in the absence of exogenous thrombin, yields an ideal scaffold for use in tissue repair (Vidhale *et al.,* 2015). Bone regeneration is centripetal (i.e. bone formation starts from the defect walls and continues towards the defect center). It is evident that bony regeneration thus will take longer in large defects than in smaller defects. Consequently, resorbable materials such as phase pure β-tricalcium phosphate or calcium sulphate may be degraded before regeneration of large defects can be attained, which may result in incomplete bone fill. Biphasic calcium phosphate are compounds of hydroxyapatite (virtually non-resorbable) and β-tricalcium phosphate (resorbable). Materials with a composition of 60% hydroxyapatite and 40% β-tricalcium phosphate have a long and successful history of clinical use.[4] We have used osteoconductive biphasic calcium phosphate with higher β-tricalcium phosphate (i.e. Hydroxyapatite 30% and 40% β-tricalcium phosphate) with the particle size of 0.5~ 1.0 mm.

The synthetic bone graft was mixed with platelet rich fibrin derived from patients own blood and used for filling the cystic cavity and have obtained good bone healing. Many techniques for obtaining autologous platelet concentrates were developed and applied in oral and maxillofacial surgery. The first generation includes platelet rich plasma (PRP), the second generation involving platelet rich fibrin (PRF) is a tissue engineering product that has gained a lot of popularity due to its promising results in the induction of bone healing. It was developed by Dr. Choukrounet alin 2001 (Mitrea *et al.,* 2015). The blood samples were taken without anticoagulant in 10ml glass coated plastic tubes immediately centrifuged at 3000 rpm for 10 minutes. It forms an uppermost layer of platelet poor plasma, the middle layer of platelet rich fibrin and lower most layer red blood cells (Dohan *et al.,* 2009). The middle layer is mixed with the synthetic bone graft and placed in cystic cavity. A sterile collagen periodontal membrane was placed over the graft to secure it.

Conclusion

The clinical case report shows that radicular cyst can be managed successfully by endodontic therapy followed by periapical surgery. Here it can be demonstrated how an in situ hardening biphasic bone substitute mixed with platelet rich fibrin along with the help of periodontal membrane can be used in guided bone regeneration. Hence, we would like to conclude that the careful clinical and radiographic diagnosis, use of advanced investigational tools such as CBCT is essential for proper diagnosis and planning of surgery. Regular long term clinical and radiographic follow up are required.

REFERENCES

Byakod P, Shaikh S, Vora R, Aher U, Mota L. Management of infected radicular cyst by surgical approach using bone graft as an adjunct. *Pravara Med Rev.,* 2014; 6(4):24–26.

Caliskan MK. Prognosis of large cyst –like periapical lesions following nonsurgical root canal treatment: a clinical review. *International endodontic journal,* 2004; 37(6):408-416.

Dohan DM et al. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Pat II: Platelet-related biologic features. *Oral Med Oral Pathol Oral Radiol Endod.,* 2006; 101:e45-50.

Dudek D et al. Treatment of a mandibular cyst with synthetic bone graft substitute. *Implants*, 2013:34–36.

Mitrea M, Rusu A, Calin DL. The management of periapical maxillary cyst by using the A–PRF (PLATALET RICH ADVANCED FIBRIN): A case report. *Romanian journal of oral rehabilitation,* 2015; 7(2):12–19.

Nair RR, Nayak M, Krishnaprasada L, Nair DS, Remya K, Nair AV. Successful surgical management of radicular cyst using bio dentine, PRF, and bone graft: A case report. *Journal of applied dental and medical sciences,* 2017; 3(2):60–63.

Rajendran R, Shivapathasundharam B. Shafer's Text book of oral pathology. 6th ed. India. Elsevier. 2009.

Vidhale G, Jain D, Jain S, Godhane AV, Pawar GP. Management of radicular cyst using platelet–rich fibrin and iliac bone grafts – A case report. *Journal of clinical and diagnostic research,* 2015; 9(6):34–36.

Zhao JH, Tsai CH, Chang YC. Management of radicular cysts using platelet rich fibrin and bioactive glass: A report of two cases. *Journal of the Formosan medical association* 2014; 113:470–476.

****