

Management of Radicular Cyst of Maxillary Anterior Region by Using Titanium-Prepared Platelet-Rich Fibrin (T-PRF): A Case Report

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Abstract

Radicular cysts are the most common inflammatory cysts found in the jaws. In order to promote bone regeneration and periapical tissue healing, surgical intervention seeks to eradicate periapical disease. With the new idea of rapid healing, autologous platelet rich fibrin is a healing biomaterial for oral surgical abnormalities. Third-generation platelet concentrate, titanium-prepared platelet rich fibrin (T-PRF), was created to counteract the negative effects of silica in glass tubes and has a longer rate of resorption. This case report's objective is to demonstrate the results of T-PRF applied to the bone defect that develops following the radicular cyst's enucleation. Following up for six months, there was a noticeable increase in bone density. Treatment of bone abnormalities with T-PRF has demonstrated efficacy. Consequently, it is believed that it can be applied as a regenerative material to cure bone abnormalities.

Introduction

Inflammatory odontogenic cysts that are localized in the jaws are most frequently radicular cysts. An inflammatory process resulting from an infection or the pulp necrosis of a nonvital tooth with the creation of a periapical granuloma stimulates the epithelial remnants of the malassez of the periodontal ligament, from which they grow.¹ Depending on the size, location, bone integrity of the cystic wall, and closeness to important structures of the cyst, treatment options for radicular cysts include non-surgical procedures as well as surgical techniques including marsupialization and enucleation. Large deficits requiring augmentation might result from radicular cysts. Different materials are employed to aid in the healing process; platelet rich fibrin (PRF) is a second-generation platelet concentrate that is enhanced with growth factors. Platelets are found between the upper layer of acellular plasma and the lower layer of red blood cells.² A novel third-generation platelet concentrate called titanium-prepared platelet-rich fibrin (T-PRF) was developed on the theory that titanium tubes, as opposed to the glass tubes used in the Choukroun approach, might be more helpful in activating platelets.³ In this case study, the impact of T-PRF after the radicular cyst in the maxillary front region was excised is discussed.

Case Report

A 20-year-old male patient with no systemic disease presented to our hospital with the chief complaint of pain in the left upper jaw anterior tooth for twelve days. There was a history of trauma about eight years ago. In the intraoral examination, there was a crown fracture at the enamel level in the left upper central incisor, and there was no mobility in the tooth. Fluctuant swelling was observed in the palatal mucosa extending from the central incisor tooth to the canine area, and not exceeding the midline. A panoramic radiographic examination revealed round-shaped, well-circumscribed periapical radiolucency covering the roots of the teeth

numbered 21 and 22 (Figure 1). It was observed that the pulp chamber of tooth number 21 was wider compared to the symmetrical tooth, and its apex was open. In the electrical pulp test, it was determined that the tooth numbered 21 was devitalized. In the cone beam computed tomography (CBCT), a round-shaped lytic lesion with regular margins was observed in the anterior region of the maxilla associated with the root of tooth number 21. Its dimensions were 13, 11 × 14, 70 × 16, 62 mm (buccolingual × mesiodistal × coronapical).

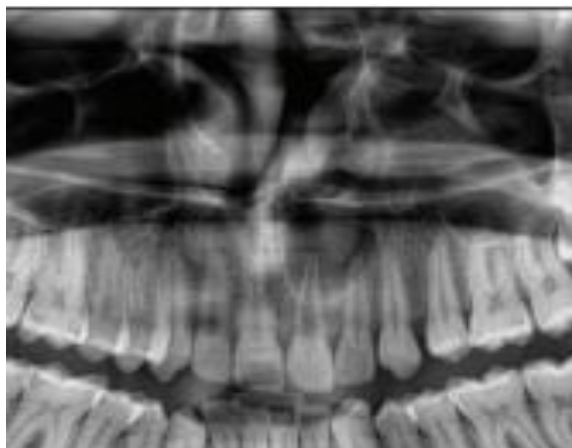
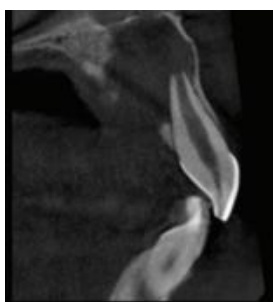
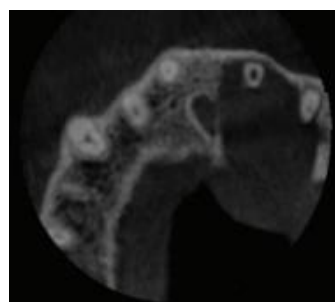


Figure 1. Preoperative Radiography. Periapical Radiolucent Lesion in the Left Maxillary Anterior Region

It had caused wide destruction in the palatal bone and it was expansile in the labial direction (Figures 2A and 2B).



(2A)



(2B)

Figure 2. Preoperative CBCT image of the cyst, the sagittal (A) sections and axial (B) sections

It was decided to enucleate the cyst following the root canal treatment on tooth number 21 with the prediagnosis of the radicular cyst. Informed consent of the patient was obtained before the surgical procedure. Under the influence of local anesthesia, the envelope flap was elevated from the area of interest. The cystic membrane was accessed from the labial region, and the complete enucleation of cyst was done. Resection of apical one-third of root was performed on tooth number 21.



(3A)



(3B)

Figure 3. Bony Defect (3A) After Enucleation of Cyst and Application of T-PRF to the Defect Area (3B)

Because of the large defect caused by the lesion after the enucleation (Figure 3A), the administration of T-PRF to the operated area was decided in order to accelerate the healing process. Similar to the conventional PRF procedures, T-PRF was generated by centrifuging blood taken from the patient into sterile titanium tubes without any anticoagulants (2800 rpm, 12 min).⁴ The fibrin obtained was placed in the defect area (Figure 3B), and the primary closure of flap was done. The excision material was collected and sent for a histopathological examination, and it was reported to be compatible with the radicular cyst. Postoperative instructions were given to the patient; analgesic and antibiotic (2 × 1, amoxicillin + clavulanic acid 500/125 mg) drugs were prescribed for five days. The patient was maintained under a regular clinical and radiographic follow-up. In the sixth month follow-up CBCT, it was observed that there was bone formation in the periphery of the lesion, and its size was reduced (Figure 4A). An increase in cortical bone was observed, partly in the labial bone and mostly in the palatal bone (Figures 4B). The postoperative course of the patient was uneventful, and no recurrence was observed.



(4A)



(4B)

Figure 4. Bone Density increased in Panoramic Image (4A) and Ossification of cortical bone in Palatal and Labial Directions in Sagittal (4B) Sections

Discussion

The most prevalent odontogenic cysts are radicular cysts, which affect the maxilla three times more frequently than the mandible. Radicular cysts are more common in the maxillary anterior region, where they may be caused by caries, trauma, or outdated silicate restorations in the anterior teeth.⁵ In this instance, trauma was the cause of the lesion's creation. Radicular cysts are found on routine radiographs and are typically asymptomatic. Sometimes these long-standing cysts show signs of acute aggravation, including swelling, tooth movement,

and displacement of an unerupted tooth. The teeth involved are always devitalized, albeit occasionally it is discovered that they are discoloured. Clinically, they manifest as palatal or buccal swelling in the maxilla, but in the mandible, they are typically buccal and infrequently lingual. It is bony hard at first, but the bone wall thins as the cyst gets bigger. When the cyst totally resorbs the bone, as in this example, the swelling becomes erratic.⁶ The size and location of the lesion determine how radicular cysts are treated. Endodontic therapy, tooth extraction, or surgical techniques like enucleation and marsupialization are possible treatments for it.⁷ In the present case, endodontic therapy was followed by curettage of the cyst, surgical enucleation, and root tip resection. The main goal of repairing big bony defects created by surgery is for the defect's interior to regenerate bone, filling the void. To restore the periodontium's structure and function, regeneration is the process of reconstructing or replicating a missing or damaged portion. Growth factors and bone transplants can help accomplish this.⁸ PRF releases a variety of growth factors that influence bone and wound healing, including transforming growth factor and platelet-derived growth factor. Due to its capacity to hasten the production of new bone and the natural healing process of wounds, PRF has recently been employed as an autogenous graft material. On the other hand, platelet aggregation and fibrin production in PRF require a glass tube containing silica. According to some research, the silica particles in the glass tube may induce contamination and damage to the fibrin structure when the patient is being administered the medication.⁹ According to Tunali et al., the clot generated with titanium tubes was clinically identical to that in glass tubes, and titanium tube-induced platelet aggregation was comparable to that observed using glass tubes.¹⁰ While T-PRF is comparable to other PRF techniques, T-PRF is distinguished by titanium-induced platelet activation. One of the metals with the best strength-to-weight ratios and resistance to corrosion is titanium. Due to its noncorrosive qualities, titanium also offers outstanding biocompatibility.¹¹ Furthermore, the study revealed that the fibrin network created by titanium tubes exhibited a more compact network structure, a longer tissue resorption period, and strong osteoconductive properties. Clinical and histomorphometric investigations demonstrated the effectiveness of using T-PRF alone in sinus lifting treatments. Twelve In a different investigation, it was demonstrated that T-PRF treats intra-bony abnormalities successfully both clinically and radiographically.¹³ The effective application of autogenous PRF to the cyst cavity following cyst enucleation was demonstrated in a clinical trial involving the examination of twenty cyst patients.¹⁴ With its advantages, T-PRF was chosen in our instance for the enlargement of the defect following enucleation. A satisfactory amount of bone regeneration was seen during the sixth month's radiographic assessment. Particularly in the palatal region and partially in the labial region, where the lesion caused extensive bone damage, complete bone formation was found.

Conclusion

In the present case report, it can be concluded that use of T-PRF in place of a bone graft promotes good functional recovery and regenerative effects. We can conclude that T-PRF is useful for augmenting bone deficiencies. T-PRF is an autologous preparation that costs less than other clinically successful regeneration materials on the market. To properly comprehend its impact on bone repair, more thorough and ongoing clinical study is necessary.

References

1. Latoo S, Shah AA, Jan SM, et al. Radicular cyst. JK Science 2009; 11: 187.
2. Lauritano D, Avantaggiato A, Candotto V, Zollino I, and Carinci F. Is platelet-rich fibrin really useful in oral and maxillofacial surgery? Lights and shadows of this new technique. Ann Oral Maxillofac Surg 2013; 1: 25.
3. Kuzu TE and Özdemir H. Evaluating the implant stability of titanium-prepared platelet rich fibrin treated periimplant osseous defects with resonance frequency analysis. Cumhuriyet Dent J 2016; 19: 154–165.
4. Tunalı M, Özdemir H, Küçükodacı Z, et al. A novel platelet concentrate: Titanium-prepared platelet rich fibrin. Biomed Res Int 2014; 2014: 209548.
5. Shear M and Speight P. Cysts of the Oral and Maxillofacial Regions. John Wiley & Sons. 2008.
6. Alarabi NM, Mo Zariba SS, Rih IHH, Elmezwghi AM, and Elsagali AH. Successful conservative surgical approach of large Pediatric radicular cysts using marsupialization technique: A rare two case reports. Egypt Dent J 2018; 64: 2013–2022.
7. Joshi NS, Sujan S, and Rachappa M. An unusual case report of bilateral mandibular radicular cysts. Contemp Clin Dent 2011; 2: 59.
8. Simonpieri A, Del Corso M, Vervelle A, et al. Current knowledge and perspectives for the use of platelet-rich plasma (PRP) and platelet-rich fibrin (PRF) in oral and maxillofacial surgery part 2: Bone graft, implant and reconstructive surgery. Curr Pharm Biotechnol 2012; 13: 1231–1256.
9. Zhao J-H, Tsai C-H, and Chang Y-C. Clinical application of platelet-rich fibrin as the sole grafting material in maxillary sinus augmentation. J Formos Med Assoc 2015; 114: 779– 780.
10. Tunalı M, Ozdemir H, Kucukodacı Z, et al. A novel platelet concentrate for guided bone regeneration: Titanium-prepared platelet rich fibrin (T-PRF). Gulhane Med J 2015; 57: 102–106.
11. Takemoto S, Yamamoto T, Tsuru K, Hayakawa S, Osaka A, and Takashima S. “Platelet adhesion on titanium oxide gels: Effect of surface oxidation.” Biomaterials 2004; 25 (17): 3485–3492.
12. Olgun E, Ozkan SY, Atmaca HT, Yalim M, and Hendek MK. Comparison of the clinical, radiographic, and histological effects of titanium-prepared platelet rich fibrin to allograft materials in sinus-lifting procedures. J Invest Clin Dent 2018; 9: e12347.
13. Reddy S, Bhowmik N, Valerian V, et al. Treatment of intrabony defects using titanium-prepared platelet rich fibrin (T-PRF): A case report. Int J Appl Dent Sci 2018; 4(1): 77–83.
14. Dar M, Hakim T, Shah A, Najjar L, Yaqoob G, and Lancker F. Use of autologous platelet-rich fibrin in osseous regeneration after cystic enucleation: A clinical study. J Oral Biol Craniofac Res 2016; 6: 29–32