Application of Platelet Rich Fibrin (PRF) on Endodontic-Periodontic Lesion in Periodontal Tissue Regereneration: Case Report

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Abstract

Endo-perio lesion is pathological / inflammatory manifestations between pulp and periodontal tissue through open structures such as the apical foramen, lateral accessory canal, and dentinal tubules. Periodontal treatment with endo-perio cases requires bidirectional treatment, pulp and periodontal. Regenerative procedures are required to regenerate damaged tissue structures. Platelet rich fibrin is a natural fibrin biomaterial obtained from platelet-rich blood anticoagulant and growth factor that initiates wound healing as well as soft and hard tissue regeneration. This case report aims to evaluate the effectiveness of platelet rich fibrin and bone graft as regenerative agent especially for periodontal tissue in cases of endo-perio lesions. A 24-year-old man came to Hasanuddin University's Dental and Oral Hospital with pain on the right upper right maxilla teeth since 6 years ago. Clinical examination showed the presence of caries with pocket depth of 8 mm. Management of this case were root canal treatment and periodontal therapy using a combination of bone graft and platelet rich fibrin as regenerative material. Treatment of endo-perio lesion with regenerative procedures using a combination of bone graft and PRF showed successful result in regeneration of periodontal tissue.

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Introduction

The relationship between periodontal disease and pulp disease was first described by Simring and Goldberg in 1964.[1] This terminology is used to describe clinical manifestations of pathologic / inflammatory pulp and periodontal tissues via open structures such as the apical foramen, accessory canal, lateral canal, and dentinal tubules in root canal.[2] Problems in pulp and periodontal tissue account for more than 50% of tooth necrosis.[1,3]

The differential diagnosis of endodontic and periodontal disease is occasionally difficult, but it is important to make the correct diagnosis so that appropriate treatment can be given. Endodontic-periodontal lesions present challenges to clinicians regarding to dental diagnosis and prognosis. Etiologic factors such as bacteria, fungi, and viruses as well as various supporting factors such as trauma, root resorption, perforation, and dental malformations play an important role in the development of the lesion.[1,3]

Cross-infections between the root canal and the periodontal ligament may occur through anatomical (apical foramen, lateral and accessory canals, dentinal tubules and palato-gingival pathways) and non-physiologic (perforated iatrogenic root canals and vertical root fractures) which determine the pathway of infection. Periodontal disease causes bone damage in the coronal to apical direction while the direction of endodontic lesions is from the apex to the coronal.[4] The necrotic pulp is rapidly attacked by bacteria. The pulp becomes necrotic, the pulp-derived immune product inducing a vascular inflammatory response in the periodontium, causing damage to periodontal fibers, adjacent alveolar resorption of the bone and cementum. The extent of periodontal damage depends on various factors such as

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virulence of microorganisms, disease duration and host defense mechanism.[5]

Based on pathological origin, Simon et al., classifies periodontal-endodontic lesions into primary endodontic lesions, primary endodontic lesions with secondary periodontal lesions, primary periodontal lesions, primary periodontal lesions with secondary endodontic involvement, or combination of lesions. Endodontic infection initiates the formation of a periodontal pocket and should be considered a risk factor in the progression of periodontitis.[2]

Probing is performed to ensure the presence and morphology of each periodontal pocket and to allow the location of communication with apical lesions. Lesions due to pulpal disease tend to heal with endodontic therapy. If periodontal lesions increase, bone damage is extended, the success of therapy tends to depend on the ability to replenish or regenerate adhesions to eliminate damage. Therefore, the decision to treat and maintain teeth with endodontic and periodontal lesions should be considered carefully with respect to the overall dental treatment plan.[6]

Periodontal regeneration requires cell biology sequences such as adhesion, migration, proliferation, and differentiation. The combination of growth factors more effectively stimulates the mineralization. Platelets contain growth factor accelerate tissue regeneration.[7] In this decade, various types of biomaterials have been discovered in dentistry that can fill bone damage areas and accelerate the healing process. The use of an autogenous material called Platelet Rich Fibrin (PRF) with growth factor concentrate for wound healing and regenerates periodontal tissue.[8]

Case Report

A 24-year-old male came to the Conservative Department of Hasanuddin University's Dental and Oral Hospital with caries, tenderness on eating and sleeping since six years ago. Patients felt pain when drinking cold beverages. He also complained the itchy teeth and sometimes bleeding. On extra oral examination, there was no abnormality. Intra oral examination showed negative on sondation, positive on percussion, negative on palpation, cold thermal tests showed positive. Probing on the mesial and distal aspects was a periodontal pocket with a depth of 8 mm, respectively, in buccal 4 mm (Figure 4). Radiographic examination showed radiolucent appearance on periapical and caries in crown accompanied by pulp perforation (Figure 1 and 2). Treatment plans was root canal treatment and periodontal therapy. After the access opening of the pulp and the preparation of the root canal followed by application of root canal medicaments, the patient consulted to the Periodontics Department.

In this case report, patients complained pain in the teeth 17 indicate the presence of irreversible pulpitis from pulp vitality test results with positive on thermal. The major diagnosis was endodontic lesions with secondary periodontal lesions, characterized by a deep carious and deep periodontal pocket.

Figure 1. Periapical Radiography.

Figure 2. Periapical Radiography.

Figure 3. Clinical Appearance.

Figure 4. Probing Depth Measurement.

Case Management

Treatment of endodontic-periodontic lesions were root canal treatment and periodontal treatment. Periodontal treatment was done in the interval of root canal treatment. In this case, periodontal treatments included surgical and non-surgical treatment. Non-surgical treatment was obtained by scaling and root planning (SRP). Surgical treatment was flap opening and regenerative procedures using a combination of bone graft and platelets rich fibrin (PRF) which scheduled after non-surgical treatment. Surgical treatment began with disinfection using povidone iodine (Figure 5) and administration of local infiltration anesthesia using pehacaine with 2% lidocaine and adrenaline 1: 80.000 in the asepsis state (Figure 6). Crevicular incision was performed using blade no.15 and full thickness flap elevation using rasparatorium respectively on buccal and palatal aspects, followed by a vertical incision to facilitate access to defect (Figure 7 and 8). Debridement using 0.9% NaCl solution and curettage using Gracey curette no. 7-8 for buccal, lingual No.9-10, mesial No. 11-12, distal No. 13-14 (Figure 9 dan 10). PRF obtained by taking 20 ml patient's blood by intravenous. The blood then centrifuged immediately with 3000 turns for 10 minutes (Figure 11). After centrifugation, the PRF coagulant is removed from the tube using a sterile clamp, the uppermost layer was platelet poor plasma (PPP), the PRF in the middle layer and the lower layer of red blood cell removed using scissors (Figure 12 dan 13).

Placement of bone graft and PRF at defect followed by flap closure and suture using 4.0 black braided silk and application of COE Pack on buccal and palatal aspects (Figure 14,15 dan 16). Antibiotic and analgesic were prescribed and follow-up at 10 days after disaffecting the suture.

Figure 5. Disinfection of Surgery Field.

Figure 6. Local Anesthetic Infiltration.

Figure 7. Crevicular Incision on Buccal Aspect.

Figure 8. Flap Elevation Using Raspartorium.

Figure 9. Curettage using Gracey Curette.

Figure 10. Debridement using NaCl Solution.

Figure 11. Blood Drawing by Intravenous.

Figure 12. Centrifuged PRF.

Figure 13. Separation of PRF from red blood cells.

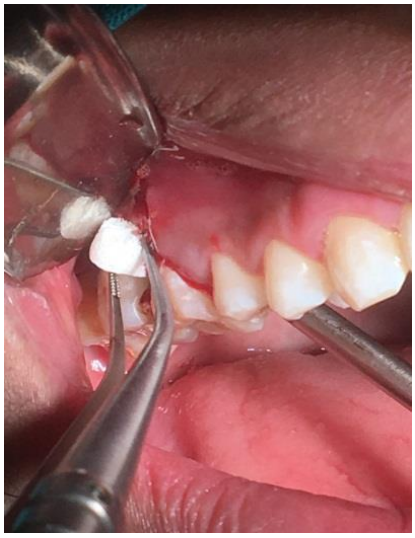

Figure 14. Bone Graft Application.

Figure 15. PRF Application.

Figure 16. Flap Suturing.

Figure 17. Application of COE Pack.

Figure 18. Post-Operative Control on Palatal Aspect.

Figure 19. Post-Operative Control on Buccal Aspect.

Discussion

Primary lesions originate from endodontic, teeth usually show symptoms marked by

periodontal lesions such as mobility, bone loss in the furcation and crest areas, the formation of deep periodontal pockets, tenderness on percussion, and purulent exudates of gingival sulcus accompanied by large carious lesions or restorations previously close to the pulp. In primarily endodontic lesions with secondary involvement of periodontal tissue or endodontic lesions occurring in teeth involving periodontal tissue, endodontic treatment should precede periodontal therapy. Periodontal treatment involves curettage, flap surgery or regenerative procedures.[6]

Teeth with necrotic pulp or previously having root canal treatment have been considered as risk factors in initiation of periodontal disease and the formation of periodontal pockets. Many studies suggest that dental pulp in the presence of periapical lesions encourage the formation of periodontal pockets, progression of periodontal disease, and disrupt the healing of periodontal lesions after periodontal treatment. It has also been found that periapical trauma may occur due to excessive instrumentation during the formation and cleaning of the root canals, extrusion of sealers and gutta percha which delay new bone formation, cementum and connective tissue repair.[5]

The prognosis of treatment for endo-perio lesions depends on the severity of periodontal disease and response to periodontal treatment. As for symptoms with discomfort to severe pain, soft gingiva, swelling, tooth mobility, tooth supra-eruption, sensitive on palpation, rapid bone destruction with deep pocket formation.[9] Periodontal regeneration therapy is a special procedure aimed at restoring dental support tissues that have been lost by periodontitis.[6] Regenerative procedures commonly use barrier membranes and bone graft materials promote growth around damaged tissues such as the periodontal ligament, cementum, bone and connective tissue. To improve the healing and regeneration process of tissue or bone, local application of growth factors/cytokines can maximize the healing process.[10]

The goal of peri-radicular surgery is to remove all necrotic tissue to facilitate the regeneration of soft and hard tissue to form new adhesions. Radiographic features of endo-perio lesions is apical radiolucency with deep pockets.[7]In this case, pulp vitality test using thermal indicates that the pulp was still vital and the negative sondation indicates the presence of pulp perforation, a negative percussion of periapical abnormalities. In this case, root canal treatment and periodontal treatment were performed. Non-surgical periodontal treatment of scaling and root planning, surgery with regenerative procedures using a combination of bone graft and PRF. Regenerative procedure can provide a better prognosis. Follow-up at 10 days after suture opening, clinical appearance showed healthy gingiva while buccal aspect still looked slightly erythema.

PRF is a new generation of platelet concentrations, containing all the blood sample compilers suitable for healing and immunity. The healing phase not only depends on infectious agent removal but also the host immune response. The addition of regenerative agents such as PRF can enhance the healing phase and act as scaffolds to retain blood clots in the early and later stages of bone formation.[11] The advantages of using PRF preparations are easy and simple, using minimal blood manipulation, requiring no additional PRF polymers consisting of platelets, cytokinins, and fibrin matrix.[12] The wound healing process using PRF consists of three as followed:

a. The imflamation phase or substrate preparation phase lasts for 1-4 days. PRF releases growth factors and cytokines in the wound area. The growth factor releases alpha granulancy on platelet thus when active, secreted and aggregated by epinephrine or collagen.
b. The proliferation phase or collagen formation phase lasts from 2-22 days. PRF stimulates osteoblast proliferation, gingival fibroblasts and periodontal ligament cells as mitogen. Molecular structures with low fibrin concentrations optimize the migration of endothelial cells and fibroblasts. The presence of migration accelerates angiogenesis.
c. The remodeling or maturation phase lasts between 6-12 months. After angiogenesis, followed by remodeling by fibrin. Leucocytes and immune cytokines such as IL. Iß, IL6, IL 4 and TNF α trapped in PRF act as immune regulation.

Application of PRF in the periodontics among others is treatment of intrabonic defects, treatment of gingival recession, GTR, and treatment of periapical lesions.[8] Several studies have combined the different regenerative potential of PRF and bone graft in the treatment of endo-perio lesions. The case report by Yu Chao et al in the application of PRF as a periodontal grafting defect material showed the effectiveness of regenerative treatment against periodontal infrabony defects. Treatment of endo-perio lesions performed by Shashikumar and Nisa using PRF without bone graft combinations showed bone formation after 12 months.[11] Goya L used of PRF and alloplastic bone substitute in lesions of the right maxillary maxillary incisor endo-perio conventional endo therapy, increased bone density and reduced probing depth after follow-up at 18 months.[6] Wadhwa and Hans case reports on treatment of apicomarginal first molar mandibular defects using PRF after 3 months, there was reduction of probing depth from 10 mm to 2 mm.[13,14]

Conclusion

Treatment of endo-perio lesions with regenerative procedures using a combination of bone graft and PRF demonstrated successful result with regeneration of periodontal tissue.

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