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CASE REPORT

Clinically Effective Regenerative Therapy for Primary Endodontic Lesions with Secondary Periodontal Lesions: A Case Report

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ABSTRACT

The diagnosis and prognosis of teeth with endo-perio lesions present a major challenge for dentists. Proper diagnosis is critical in determining treatment and the long-term prognosis. However, treating complex endodontic and periodontal lesions is one of the most common challenges in current clinical practice. The coexistence of pulpal and periodontal tissue damage may complicate diagnosis and further influence dental prognosis. This article consists of a case report evaluating the efficacy of xenografts and resorbable membrane pericardium in treating bifurcation lesions associated with periodontal lesions of the left mandibular first molar. A 22-year-old female patient was referred by conservative dentistry with complaints of gingival swelling on tooth 36 with furcation involvement associated with periodontal lesions. A gingivectomy was performed after the first stage of periodontal therapy because gingival swelling precluded endodontic treatment. After 3 months of endodontic treatment, the grade II bifurcated lesion had not yet healed, so regenerative surgery using xenografts and a resorbable pericardial membrane was performed. Periodontal treatment showed no gingival inflammation, and radiographic evidence showed bone improvement. Endo-perio lesions are complex in etiology and require a high degree of expertise to identify and treat them. Therefore, effective treatment of lesions requires collaboration between various multidisciplinary disciplines.

Key words: endo-perio lesions, furcation involvement, pericardium resorbable membrane, the endodontics treatment, xenograft

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INTRODUCTION

The periodontium and dental pulp are anatomically connected via the apical and lateral foramen, which allows the entry of pathogens between these structures. Although many factors contribute to the development of endo-perio lesions, the leading cause is a bacterial infection with complex microbial flora.[1] Endo-perio lesion is associated with periodontal and pulpal disease in the same tooth element. Endo-perio lesions present challenges to the clinician regarding the diagnosis and prognosis of the teeth involved. Etiological factors such as bacteria and other contributing factors such as trauma, root resorption, perforation, and tooth malformation play an essential role in developing these lesions.[2]

Endodontic-periodontal lesions have several classifications, including those based on Simon et al.'s classification, namely primary endodontic lesions, primary endodontic lesions with secondary periodontal involvement, primary periodontal lesions, primary periodontal lesions with secondary endodontic involvement, and combination lesions.[3] Periodontitis has a simple diagnosis. In primary endodontic disease, the tooth does not respond to vitality tests because it is infected and non-vital. In contrast, the pulp is responsive to thermal and electrical tests in primary periodontal lesions. Nonetheless, combined lesions, primary endodontic lesions with secondary periodontal involvement, or primary periodontal lesions with secondary endodontic involvement are similar clinically and radiographically. The diagnosis in these

cases can be made by a careful clinical examination, followed by radiography and tests to detect pulp vitality, furcation, periodontal pockets, fistulas, and cracked teeth.[4]

A correct diagnosis and prognosis of endo-perio lesions is required to determine the optimum management and treatment outcome. The most important factors to consider prior to initiating a treatment plan are the vitality of the pulp and the extent of the periodontal destruction. Primary endodontic lesions usually heal after proper endodontic treatment.[5] The diagnosis and prognosis of teeth with endo-perio lesions present challenges to the clinician. The simultaneous presence of pulpal and periodontal tissue damage can complicate the diagnosis and further affect the teeth's prognosis.[6] In this case report, we describe a case of patient with bifurcation lesions associated with periodontal lesions of the left mandibular first molar that was treated with xenografts and resorbable membrane pericardium.

CASE REPORT

A 22-year-old female patient was referred by the conservative dentistry department of USU General Hospital, Medan, Indonesia. The patient had first attended the hospital 3 years earlier and had been treated for cavities in the left mandibular first molar. One year post-treatment, she experienced a throbbing pain in the treated tooth, and the tooth was treated and filled by a general dentist. The filling had fallen out while the patient was eating and was now exposed. The patient reported that she often felt a throbbing pain in the tooth and that she had noticed pus surrounding the gum area of the painful tooth about 3 months earlier. At the time of presentation to our clinic, the tooth was not causing pain, but the patient wished the tooth to be treated. The patient had no history of systemic disease and was not taking any regular medication.

Physical examination results and vital signs were within normal limits. Extra-oral examination revealed a symmetrical face, normal lip muscles, no lip abnormalities, normal temporomandibular joint, palpable lymph nodes, and no pain. On intra-oral examination, gingival swelling on tooth 36 was accompanied by endo-perio lesions. An examination using a Nabers probe revealed a lesion in the furcation at a depth of more than 1 mm (*cul de sac* lesion). On objective examination, tooth 36 had caries on the occlusal and proximal lingual surfaces with the caries penetrating the pulp. Gingival swelling was found to be accompanied by the involvement of the furcation associated with an endo-perio lesion (Figure 1A). Thermal test results with ethyl chlorine were negative. A percussion test was positive, and a palpation test was negative. The presence of grade 1 tooth mobility was detected. On radiographic examination, there was

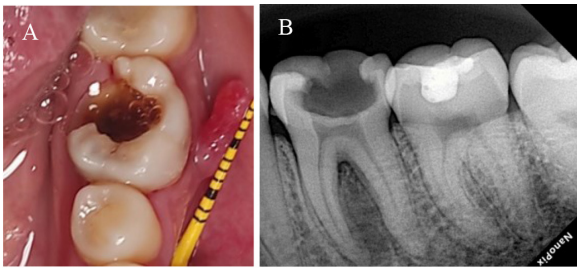

Figure 1. (A) Preoperative clinical picture of tooth 36 showing caries in the proximal occlusal portion that reaches the pulp accompanied by swelling of the gingiva in the buccal area of tooth 36 and (B) Preoperative radiographic image showing a radiolucency in the crown of tooth 36 which has reached the pulp chamber and There is a radiolucent area in the alveolar bone furcation area of tooth 36.

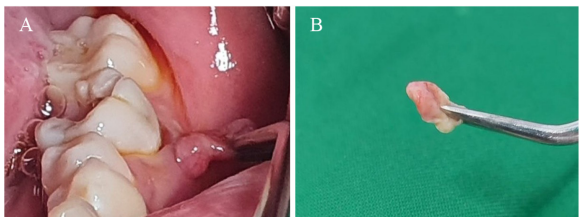

Figure 2. (A) Clinical features of swelling in the buccal area of tooth 36 (B) Results of gingivectomy excision.

a radiolucency on the crown of tooth 36, indicating that caries had reached the pulp. There was also a radiolucency in the alveolar bone in the furcation area of tooth 36 (Figure 1B).

The diagnosis was pulpal necrosis of tooth 36, accompanied by an endo-perio lesion (a primary endodontic lesion with secondary periodontal involvement). The treatment plan for tooth 36 was root canal treatment of the tooth, with final restoration with a class II composite resin cavitation and continued with guided tissue regeneration (GTR) periodontal surgery, which was performed by administering xenograft bone grafts and the pericardial periodontal membrane to treat bifurcation defects.

At the first visit, the patient signed an informed consent before starting treatment. Due to swelling of the gingiva in the buccal area of tooth 36, which prevented the installation of a rubber dam (Figure 2A), patients who were planned to undergo root canal treatment underwent the gingivectomy stage first. The gingivectomy procedure was performed using an electrocautery device by swelling was excised (Figure 2B). At a follow-up visit 7 days later, it was apparent that the gingival area had healed, and the patient progressed to the root canal treatment stage.

For root canal treatment, the tooth was isolated using a rubber dam. Next, the entire carious tissue was removed using a small round diamond bur, and the

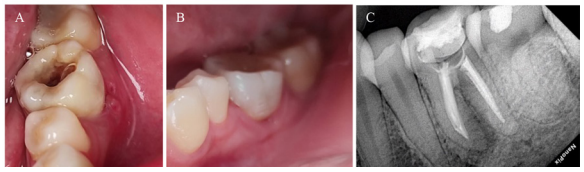

Figure 3. (A) Endodontic preoperative clinical picture (B) Results of final composite resin restoration (C) Radiographic appearance 3 months after root canal obturation.

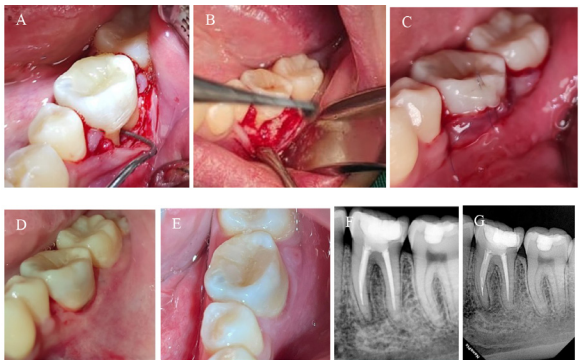

Figure 4. (A) Visual appearance of the furcation defect on tooth 36 (B) Administration of bone graft and placement of a resorbable pericardial membrane (C) The flap was sutured using a modified sling suture technique using composite resin in the buccal area as anchorage using non-resorbable thread silk 3-0 (D) Clinical picture 7 days post-periodontal surgery appears to be healing (E) Clinical picture 3 months after periodontal surgery, (F) Radiographic 3 months and (G) 12 months after periodontal surgery.

proximal lingual wall was removed (Figure 3A). The pulp chamber was opened using an endoaccess bur and irrigation with 2.5% NaOCl. Working length measurements were obtained using an electronic apex locator and confirmed by radiographs. The root canals were shaped and cleaned using hand K-files and the reciprocal blue file system. The root canals were irrigated with 2.5% NaOCl and 17% EDTA at each tool change. After the root canal preparation was completed, the root canal was irrigated with 2% chlorhexidine digluconate solution and rinsed with saline solution. The root canals were dried with paper points. The root canal dressing was carried out with $Ca(OH)_2$ paste, and then the cavity was closed using a temporary filling.

The patient did not complain of pain on the third visit. On objective examination, the percussion test was negative, the palpation test was negative, the mobility was negative, and the temporary filling was still intact. The temporary filling was removed using an ultrasonic scaler, and the root canal was irrigated with 2.5% NaOCl, 17% EDTA solution, and 2% chlorhexidine solution for ± 1 minute, then dried with a paper point. The root canal was then obturated with guttapercha and AH sealer using a continuous wave technique. Final restoration using composite resin (Figure. 3B). The results of root canal obturation were confirmed by taking a periapical radiograph (Figure. 3C). The patient was given instructions on oral hygiene and a follow-up visit was scheduled 3 months later to check for persistent furcation lesions, then GTR periodontal surgery would be performed.

The patient continued phase I therapy and received instructions on oral hygiene and thorough scaling after the endodontic treatment had been completed. At the 3-month follow-up visit, an evaluation of tooth 36 revealed a persistent furcation lesion. Thus, the patient progressed to phase II of the treatment plan, comprising a periodontal surgical procedure. Prior to surgery, the patient was given local anesthesia using 2% articaine.

The first stage of GTR surgery was started by making a sulcular incision on the buccal aspect of tooth 36, which started from the gingiva of the second premolar to the gingiva of the second molar. A full-thickness mucoperiosteal flap elevated was used to visualize the furcation area (Figure 4A). Curettage was performed using a Gracey curette until all of the granulation tissue was removed followed by irrigation using saline solution, then taking care to control bleeding. GTR was performed with xenograft material placed in the furcation area of tooth 36 and granule put until it condensed properly. A resorbable pericardial membrane is placed over the bone graft material, holding the xenograft material in place (Figure 4B).

The flap was sutured using a modified sling suture technique using composite resin in the buccal area as an anchorage using 3-0 non-resorbable silk thread (Figure 4C). Periodontal packs are then placed to protect the surgical site. The patient has been prescribed 500 mg of amoxicillin and 500 mg of mefenamic acid three times daily for 5 days. Patients were also given postoperative instructions and advised to use 0.2% chlorhexidine gluconate mouthwash. A follow-up visit was scheduled 2 weeks later to remove the sutures. At the return visit 2 weeks later, the patient had no complaints of pain or discomfort. Clinically, the gingiva of tooth 36 showed no inflammation or swelling, and the surgical area was healing well (Figure 4D). The patient was asked to return for control after 3 months.

At the 3-month follow-up visit, percussion, palpation, and mobility tests were negative. The composite resin restoration was obtained during maintenance visits. The patient had no complaint of pain after surgical treatment, and of the teeth (Figure 4E). Clinically, the periodontal tissue showed no signs of inflammation and no swelling of the gingiva, and an alveolar bone radiograph showed bone improvement compared to the radiograph before treatment (Figure 4F). The patient was pleased with the results at the time of follow-up 1 year later (Figure 4G). An important aspect of the current case was that the patient adhered to the scheduled follow-up visits.

DISCUSSION

In the case of endo-perio lesions, it is important for the dentist to know how to differentiate between the etiologies of endo-perio lesions, including all the connecting pathways between the pulp and periodontium that act as "bridges" for microorganisms, thereby allowing the spread of infection from one area to another. Endo-perio lesions have a complex pathogenesis and require good skill in identifying and treating them through clinical and radiographic examination. Therefore, cooperation between various disciplines, including periodontists and endodontists, is highly recommended for the comprehensive treatment of lesions.[1] Treatment using root canal treatment combination with bone graft was more used than other treatment options in endodontic–periodontic lesions.[7]

Endo-perio lesions are common, but clinicians often face difficulties when diagnosing. However, if a careful history is taken and a thorough clinical examination is performed, these lesions can be fully treated to yield good results. The clinical examination should include pulp vitality, cavity, percussion, palpation, and pocket depth tests, in addition to periapical radiography. In this case, a pulp vitality test revealed a non-vital tooth, pointing to endodontic involvement. Defects in the furcation area suggest secondary periodontal involvement that requires specific treatment to achieve success. The success rate of primary endodontic lesions with periodontal involvement without surgical regeneration has been reported to range from 27 to 37%, indicating the need for periodontal surgical intervention.[8] The surgical procedure aims to remove all necrotic tissue from the periapical area to seal the canal system. Pulp completely to facilitate hard and soft tissue regeneration, including the formation of new attachments.[9]

The most common clinical and radiographic features in cases of endo-perio lesions include a periapical radiolucency and furcation defect associated with a non-vital pulp. Conventional approaches to treating endo-perio lesions include non-surgical debridement of the pulp chamber and root surface and surgical approaches to improve access to apical lesions and reshape the surrounding bony tissue in the root. Bone loss caused by pulpal disease is reversible, whereas progressive bone loss caused by periodontal disease is usually irreversible.[10] The possible need for surgical periodontal therapy remains because periodontal bone loss is usually advanced and less likely to heal after nonsurgical pulp canal therapy.[11]

Cases of combined endo-period lesions are generally root canal treatment, which may result in an endodontic healing component. In both endo-perio treatment procedures, the prognosis depends on good healing of the periodontal tissue initiated.[12] However, in this case, periodontal disease did not appear to have fully resolved after endodontic therapy, as demonstrated by no change in the clinical parameters. Hansrani V. explains why a root filling that appears successful on a radiograph may fail and why one that appears unsuccessful on a radiograph may succeed. If the root filling appears radiographically unsatisfactory but is successful, it would be advantageous to monitor this further as the quality of shaping and obturation of the canals are not the only determinants of endodontic success, even though they are the only features shown on an endodontic radiograph.[13]

Calcium hydroxide and antibiotic paste can be used as intracanal medicaments if the primary cause is an endodontic lesion. They are bactericidal, anti-inflammatory, and proteolytic and tend to inhibit resorption and promote repair.[14] They are effective in endodontic lesions with extensive periapical pathology and periodontal pockets and usually resolve the pocket within a few weeks. In this case, no improvement was seen from the periodontal aspect after endodontic therapy.[15] The availability of a wide range of regenerative materials for use in periodontal surgery today enhances the possibility of successful periodontal treatment.[16]

A combination of GTR with an adequate root canal treatment in the involvement of pulpal and periodontal lesions will improve the likelihood of treatment success in cases of endo-perio lesions. GTR procedure is a procedure that involves the removal of granulation tissue and the placement of bone graft with the purpose of creating healthy periodontal tissue.[17-19] Xenograft bone graft was used in this case because it has osteoconductive properties and acts as a scaffold for the growth and deposition of new bone formation. A non-resorbable membrane was used as a barrier toward the epithelial cells. Post-GTR, no further procedures were performed in accordance with the standard surgical protocol.[20]

In general, autograft material is considered the gold standard because it is the only bone substitute material with osteogenesis, osteoinduction, and osteoconduction properties.[21-23] Although periodontal therapy and bone regeneration using autograft can achieve clinical results that can be predictable, but require secondary surgical site autograft bone graft removal (i.e., donor site) and may increase postoperative patient discomfort. To overcome this problem, operators choose xenograft as the bone graft material. The main advantages of using bone substitutes unlimited availability and reduced morbidity.[24]

Xenograft material is a bone substitute material that can be one of the choices of bone graft materials that can be used. A xenograft is a biocompatible and osteoconductive material that acts as a scaffold, offering a chemical and surface environment conducive to stimulating new bone formation. Xenograft

can facilitate the formation of new bone and bone remodeling necessary to achieve optimal strength without interruption. A xenograft is a biocompatible and osteoconductive material that acts as a scaffold, in which osteoblasts function to form bone and maintain space for regeneration. Complete bone formation occurs within a year after periodontal surgery.[16]

E-PTFE membrane is considered the gold standard for membranes, and excellent results have been achieved with this material. However, bacterial contamination often results in the need for additional surgery 4–6 weeks after tissue regeneration.[25] Absorbable membranes were developed to circumvent this limitation. Absorbable membranes can be of animal origin or synthetic polymers and are gradually hydrolyzed or enzymatically degraded and therefore do not require a second stage of surgical removal of the membrane. In this case, a bone graft was used, followed by the placement of the pericardial periodontal membrane. Various sources of periodontal pericardial membrane materials include rat or bovine collagen. According to Athar et al., the bovine pericardium membrane has the potential to act as a barrier membrane as well as a scaffold for the guided tissue regeneration procedure.[26]

CONCLUSION

Multidisciplinary collaboration is needed to treat this lesion effectively. Comprehensive root canal treatment and periodontal management are essential for long-term success. Endo-perio lesions have a complex pathogenesis and require high skill to identify and treat. Post-treatment observation for a sufficient period is essential before making a decision to retreat. In this case, the endo-perio lesion was managed by root canal treatment followed by periodontal surgery using bone graft xenograft material and pericardial resorbable membrane. The results of post-treatment healing were good, characterized by the radiographic evidence of bone repair, absence of gingival inflammation, absence of complaints, and patient satisfaction with the treatment that has been done.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this case report.

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