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Treatment of Periodontitis with Furcation Lesions and Vertical Alveolar Bone Loss: Case Report

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Abstract

Chronic periodontitis is an inflammatory disease induced by bacterial biofilm and characterized by gingival inflammation, loss of attachment, and alveolar bone resorption. Regeneration of the periodontium is a primary goal in treating teeth affected by periodontitis. This case report describes two cases of the treatment of periodontitis with furcation lesions and vertical alveolar bone loss by xenograft bone grafting and membrane placement. This case report describes two cases with the main complaints of gingival bleeding when brushing teeth in the mandibular posterior teeth. The first case showed 46 teeth with a probing depth of 9 mm and grade 2 buccal furcation involvement, and the second showed a probing depth of 36 teeth 6 mm and grade 1 buccal furcation involvement. Based on the periapical radiographic, the two cases presented vertical bone loss. After initial therapy in both patients, it was continued with periodontal flap surgery accompanied by xenograft bone grafting and membrane placement. After four months of follow-up, no bleeding and inflammation were found in the gingiva, and a reduction in pocket depth. Periodontal regenerative surgery in periodontitis with furcation lesions accompanied by vertical bony loss can assist in relieving inflammation and reducing pockets.

Keywords: periodontal regeneration; periodontitis; furcation lesions

1. Introduction

Periodontal disease is characterized by the loss of connective tissue attachment induced by periodontal pathogens within the gingival sulcus. The destruction of periodontal tissues progresses in the apical direction, affecting all periodontal tissues: cementum, periodontal ligament & alveolar bone. The lesion progress is affected by several factors: inflammatory response, type of bacteria present, organic conditions, and local factors [1]. In the posterior segments of dentition, numerous factors play a role in influencing the onset & progression of periodontal disease. If unabated, the progress of inflammatory periodontal disease ultimately results in attachment loss sufficient to affect the bifurcation of multi-rooted teeth. This is one of the most serious sequels of periodontitis [2]. The furcation is an area of complex anatomic morphology that may be difficult or impossible to debride by routine periodontal instrumentation [3].

In Glickman's classification for furcation involvement, a grade I lesion is an incipient or early stage. The periodontal pocket in the grade I furcation lesion is supra- bony and primarily affects soft tissues [3]. Grade II lesion is a cul-del-sac with a definite horizontal component. If multiple defects are present in the same tooth, they do not communicate. In grade III furcation involvement, alveolar bone is not attached to the dome of furcation, but soft tissue still covers the furcation area. In grade IV furcation involvement, interradicular bone is destroyed, and soft tissue has receded apically so that the opening of furcation is clinically visible [4]. Treating and managing teeth with

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furcation involvement presents one of the greatest challenges in periodontal therapy. The therapy of furcation involvement depends primarily on the disease's extent, the affected tooth's strategic importance, and the degree of patient [5].

Regeneration is the process of repairing damaged or injured parts. This biological process increases architectural and tissue functions. The periodontal regeneration process includes alveolar bone restoration, periodontal ligament, and cementum [6]. GTR has been widely used in the periodontium regeneration process for decades. This regenerative surgical process involves repairing mucogingival flaps around the affected tooth, scaling and root planning, and placing a barrier under the gingiva. The biological basis of the GTR technique is to block the growth of apical epithelium into space above the exposed root surface by using a barrier membrane so that PDL cells and osteoblasts can form PDL tissue and alveolar bone. Bone graft is material that is placed in the space between or around broken or deformed bones [7].

The main functions of all bone graft agents are osteoconduction, osteoinduction, and osteogenesis. As osteoconduction, the graft acts as a pattern or net to guide bone formation. In contrast, as osteoinduction, the graft stimulates new bone formation, and as osteogenesis, the graft cell produces new bone. Bone grafting is a surgical technique to replace lost bone using bone graft material. The ideal bone graft material must have the potential to keep cells alive, not cause an immunologic reaction, be easily obtained, provide strength around the bone, and not spread disease [8]. A demineralized freeze-dried bone allograft (DFDBA) is an allograft composed of demineralized bone matrix (DBM) following the demineralization of a freeze-dried bone allograft (FDBA). Though various bone graft options have been used to regenerate periodontal tissue, DFDBA is used the most often. It effectively reconstructs furcation and periodontal defects and has also demonstrated osteoinductive effects. Implanted in already well-vascularized bone can stimulate cell attachment, migration, and osteogenesis [9]. This case report describes two cases of the treatment of periodontitis with furcation lesions and vertical alveolar bone loss by xenograft bone grafting and membrane placement.

2. Case Report

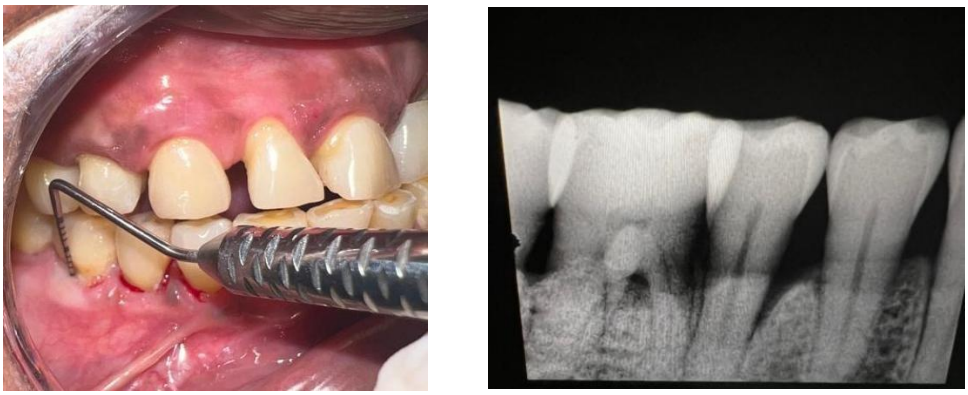
2.1. Case Report

A 56-year-old man came to the periodontium clinic at USU Dental Hospital with complaints of bleeding gums and bad breath. Based on the history, the patient did not have systemic disease. Horizontal teeth brushing pattern with short movements. The clinical examination results showed poor oral hygiene (CI=2,3; DI=2,5). The tooth pocket depth was 9 mm on the mesial side of tooth 46, and the attachment loss was 7 mm (Figure 1). Clinical diagnosis of generalized periodontitis stage III grade C. Radiographic appearance of bone destruction reaching the middle 1/3 of tooth 46. The treatment plan that will be carried out is oral hygiene instructions, scaling, root planning, evaluation and maintenance therapy, and surgical treatment of flaps and bone grafts on tooth 46.

Before surgery, the patient signed an informed consent. The extra and intraoral asepsis was performed by administering an antiseptic solution, 10% povidone-iodine. Surgical procedures were performed under aseptic conditions with the administration of local anesthesia on tooth 46. A sulcular incision was given, and a full-thickness mucoperiosteal flap was elevated from the mesial tooth 48 to the mesial 45 so that the defect area was visible. (Figure 2) The defect sites were thoroughly scaled and root planed with a Gracey curette to remove granulation tissue and necrotic cementum, irrigated with 3% H2O2 solution, rinsed with saline, and irrigated again with 1% povidone-iodine. Then, the allograft graft material and absorbable membrane were applied. (Figure 3)

Flaps were repositioned and closed using 5-0 black silk interrupted sutures. The operating area was cleaned of blood and then covered with a periodontal pack. (Figure 4) The patient was given 500 mg amoxicillin, 500 mg metronidazole, and 500 mefenamic acids for 4 days and was advised to refrain from tooth brushing, flossing, and interdental cleaning techniques in the treated area. Postoperative control: 1 week after surgery, the periodontal package was opened, and saline irrigation was performed. One week later, the sutures were opened, and irrigation

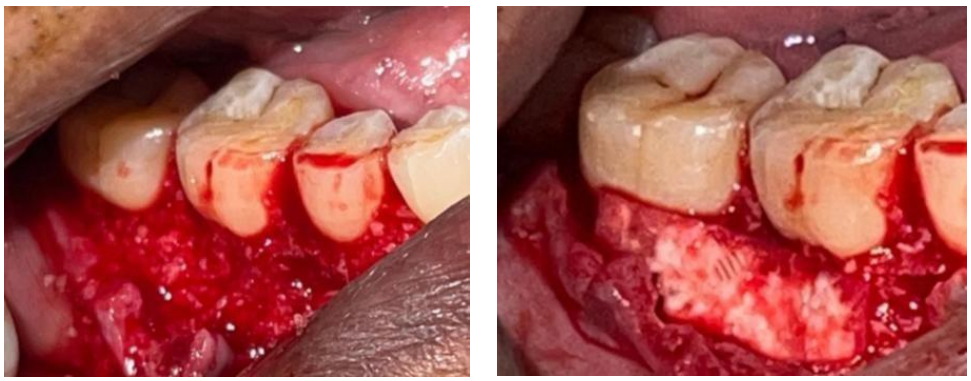
was done with povidone-iodine. The gingiva appears pink, and the patient is comfortable and does not complain of pain.



(a) (b)

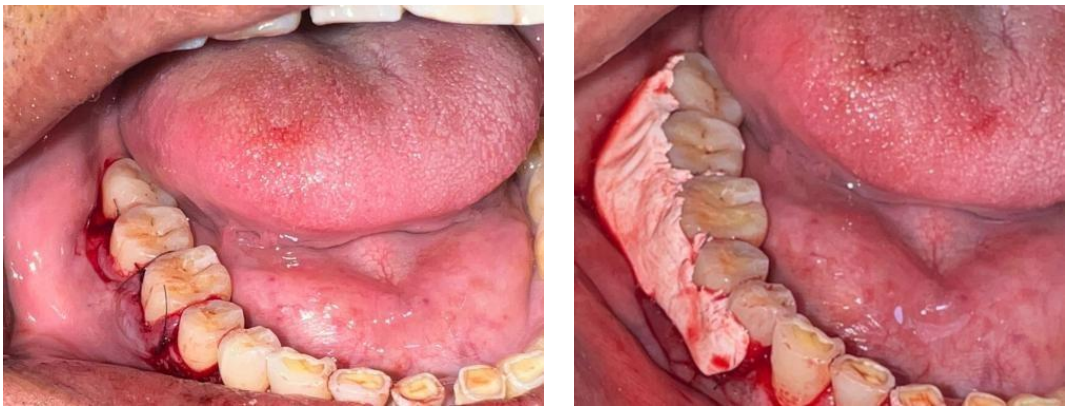
Figure 1. Pre-operative pocket depth and clinical attachment level measurements. b. The radiographic appearance of bone destruction reaching the middle 1/3 of tooth 46

Figure. 2 Flap was reflected



(a) (b)

Figure 3 a. Bone graft applied. b. An absorbable membrane is used.



(a) (b)

Figure 4. a. Sutures placed. b. Pack periodontal

The clinical and radiographic parameters at baseline were recorded postoperatively at 3 months. Postoperatively, the xenograft resulted in a 2 mm reduction in probing depth (Figure 5). The patients were reinforced with oral hygiene instructions at every visit.

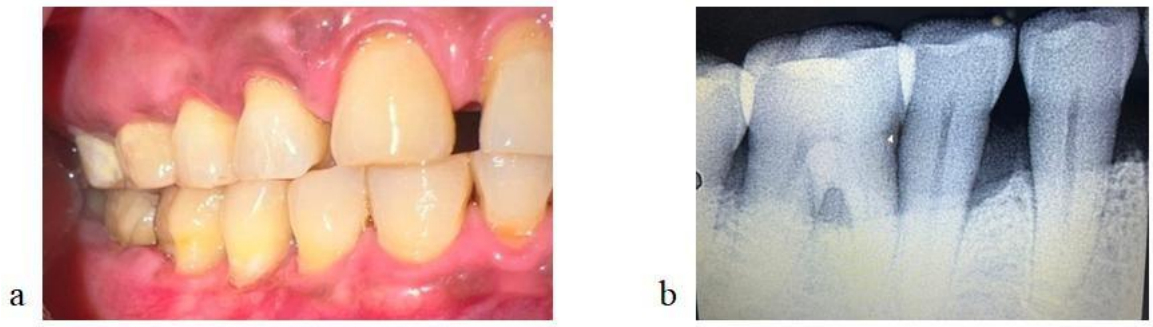


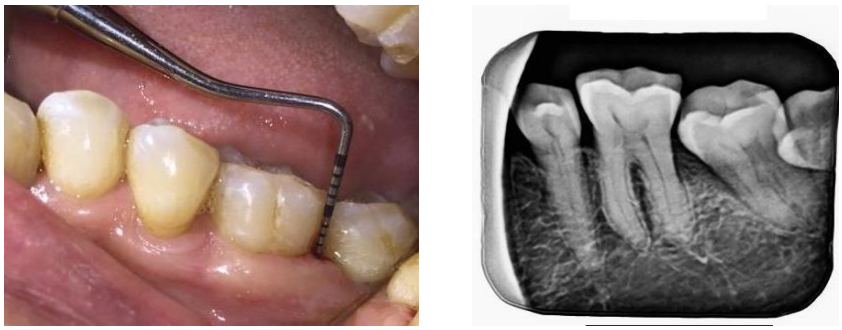
Figure 5. 3 months after surgery a. clinical view b. Radiographic view

2.2. Case 2

A 61-year-old male patient came to the Dental and Oral Hospital, Faculty of Dentistry, University of North Sumatra (RSGM USU) with complaints of pain and swelling in the lower right tooth with the main complaint that his gums sometimes bleed when brushing his teeth, especially the lower teeth since 6 months ago. The right and left upper teeth also ache when eating and drinking cold. There was no history of systemic disease.

Clinical examination found poor oral hygiene (CI=1,7; DI=1,3). The tooth pocket depth was 6 mm on the mesial side of tooth 36. The clinical diagnosis was generalized periodontitis stage II grade B. Radiological bone destruction reached 1/3 apical to the tooth with the majority of bone loss vertical. (Figure 8)

The treatment plan will be carried out with oral hygiene instructions, scaling and root planing, occlusion adjustments, evaluation and maintenance therapy, surgical therapy, and bone grafts on the teeth. Surgical procedures were performed under aseptic conditions with the administration of local anesthesia. Sulcular incisions were given, and a full-thickness mucoperiosteal flap was elevated. Defect sites were thoroughly scaled and root planed, and all granulomatous tissue was removed. A defect was treated with allograft in putty form and membrane. (Figure 9) Flaps were repositioned and closed using 5-0 black silk interrupted sutures. (Figure 10)



(a) (b)

Figure 7. Pre-Treatment Clinical view a. Clinical view b. Radiographic view

(a) (b)

Figure 9. Placement of graft a. Allograft b. Membrane

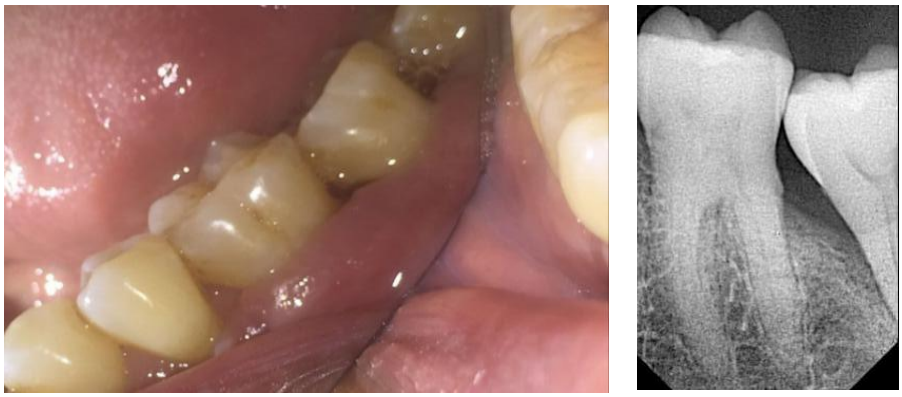
Figure 10. Sutures placed

After the surgical procedure, patients are given postoperative instructions and medication, which are analgesics (mefenamic acids 500 mg) and antibiotics (amoxicillin 500 mg), for four postoperative days. A recall appointment was made at 3 months. Professional prophylaxis and oral hygiene reinforcement were performed at these visits, clinical parameters were recorded, and intraoral periapical radiographs were taken. (Figures 11 and 12)

3. Discussion

The ultimate goals of periodontal therapy are to regenerate the lost attachment apparatus and return to pre-disease architecture. Multiple approaches have been used to resolve furcation defects, including autografts, demineralized

freeze-dried bone allografts (DFDBAs), bovine-derived xenografts, barrier membranes, and combinations of membranes and bone grafts [10]. In the present case, a combined approach using bone graft and GTR membrane was used to treat mandibular grade I and II furcation defects. The bone graft material used contains apatite carbonate (a component of bone) as well as a naturalized collagenized polymer.



(a) (b)

Figure 11. 3 months post-operative a. pocket depth and clinical attachment level measurements b. periapical radiograph

At the initial visit, scaling and root planing were carried out to eliminate microbial etiology and aggravate factors of periodontal disease. After three months, cases one and two were treated with flap surgery and bone grafts because the pocket depth was still deep. Bone grafts are needed because cases one has furcation grade 2 and two have furcation grade 1.

In case one, 3 months after the flap surgery and bone grafting, it appeared clinically that the gingiva was healthy and attached, the gingival recession was 3 mm, and the pocket depth examination had been reduced to around 2 mm. From radiographic readings, it can be seen that there is an increase in bone height in the mesial and distal parts of the teeth. In case two, three months after the flap surgery and bone grafting, the gingiva was clinically healthy and fixed, the gingival recession was 3 mm, and the pocket depth examination had been reduced to around 7 mm. Radiographically, there is an increase in bone height on the mesial and distal teeth.

The choice of bone graft with the allografts type has been proven based on research by Gawish et al demonstrated that rats with induced periodontitis treated with demineralized freeze-dried bone allograft for two weeks revealed signs of PDL regeneration in the form of well-defined but unorganized fibers found close to alveolar bone associated with a mild increase in the thickness of bone trabeculae related to the disappearance of osteoclasts in their Howship's lacunae [9]. These results are in agreement with Acocella et al., who concluded that allograft alone could have an osteoinductive effect, elicit bone resorption when implanted in mesenchymal tissues, and be suitable for reducing heterologous bone tissue antigenicity without inducing biomechanical changes in the material [11].

Evidence indicates that GTR provides only limited advantages in treating class II maxillary furcation. Regeneration by grafting may be further enhanced using barrier membranes that exclude gingival fibroblasts and epithelium from the healing site. It has also been shown that the guided tissue regeneration procedure, using membranes, holds promise for increasing the success of bone grafting [12]. Bone graft healing can be divided into five stages: inflammation (chemotaxis activity stimulated by necrotic debris), osteoblast differentiation from precursors, osteoinduction (osteoblast and osteoclast function activity), osteoconduction (new bone forming over scaffold) and remodeling which process continues for years.[11]

Furcation involvement is the most difficult type of defect to standardize. Along with the variables associated with the osseous defect itself, aspects related to the tooth, and more specifically with furcation morphology, play a

significant role in the outcome of GTR. The results obtained in this study confirm that many variables may render the treatment of grade II furcation defects unpredictable [13].

4. Conclusion

The results of the present case report suggest that the successful management of the furcation of the mandibular molar by periodontal regenerative therapy for the grade I and grade 2 furcation involvement of 46, 36 with bone graft along with GTR membrane resulted in a significant amount of bone fill with improved clinical attachment levels and healthy gingiva.

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