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Integrated Regenerative Solutions for Management of Endo-Perio Lesions in Mandibular Molars: A Case-Report

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Abstract

Endo-perio lesions, characterized by concurrent inflammation of the periodontium and pulp, often necessitate a multidisciplinary treatment plan. The endodontic therapy, aimed at treating the infected pulp and ensuring root canal disinfection, is essential. Concurrently, periodontal regenerative procedures incorporating bone grafts and growth factors are crucial for restoring the damaged periodontal tissues, including the alveolar bone. This multidisciplinary approach not only preserves the natural tooth but also prevents the progression of disease and potential complications. This case report illustrates the successful treatment of a class II furcation defect through the synergistic application of bone grafting and platelet-rich fibrin (PRF) as a guided tissue regeneration (GTR) membrane. Six months postoperatively, there was a significant gain in clinical attachment level. Radiographically, there was a significant amount of bone fill observed.

Keywords: allograft, endo-perio lesions, furcation, periodontal regenerative therapy, platelet rich fibrin

Introduction

The pulp and periodontium, though distinct in anatomy and function, share a close and complex relationship that has significant clinical implications, particularly in the context of endodontic-periodontal lesions. The pulp, located in the center of the tooth, and the periodontium, which supports the tooth, communicate through various pathways, contributing to the interdependence between these two tissues. The relationship between periodontal and pulpal disease was initially described by Simring and Goldberg in 1964.[1] An endo-periodontal lesion is

defined as a pathological communication between the endodontic and periodontal tissues of a given tooth.[2]

Pathophysiology of endo-perio lesions and furcation involvement

Endo-periodontal lesions involving the furcation of molars are complex and challenging cases. Cucolo, et al. (2022) in their study observed a higher prevalence of endodontic-periodontal lesions in molars as compared to non-molars with furcation rarefaction observed in 36.2%.[2]

The pathogenesis of furcation involvement in endo-periodontal lesions is a multifactorial process. While the exact contribution of pulpal pathology to the development of furcation involvement remains uncertain, the high prevalence of accessory canals and furcal canals in molar teeth suggests a potential link between the two. Anderegg et al. observed that 2.8% of mandibular molars and 0.3% of maxillary molars have furcation canals communicating between the pulp chamber floor and the furcation area. Additionally, the presence of deep pockets or periodontal defects in the furcation region can provide a direct pathway for bacteria to enter the root canal system. Anatomical predispositions, such as complex furcation morphology or thin root walls can facilitate bacterial invasion. Additionally, iatrogenic factors, such as over-instrumentation or inadequate root canal sealing, can create pathways for bacterial penetration into the furcation.[3] The synergistic interaction of these factors ultimately results in the development of a furcation lesion, characterized by inflammation, bone loss, and potential tooth loss. Once the furcation is involved, it complicates treatment because of the difficulty in accessing and thoroughly cleaning of these areas, making the lesion more challenging to manage and requiring a combination of endodontic and periodontal therapies.

Based on this concept, Simon et al. (1972) classified endo-perio lesions based on their primary origin: pulp or periodontium as primary endodontic lesion, primary periodontal lesion, primary endodontic lesion with secondary periodontal involvement, primary periodontal lesion with secondary endodontic involvement and true endo-periodontal lesion.[4] The treatment plan and prognosis depend mainly on the diagnosis of endodontic or periodontal disease. The main factors to consider are the pulp vitality and the extension of the periodontal defect.[5]

Various therapeutic modalities have been proposed for the management of furcation involvement, including non-surgical therapy, open flap debridement, root surface bio-modification, and regenerative procedures such as guided tissue regeneration (GTR) and bone grafting. Alloplast bone grafts especially biphasic composite bone graft containing 70% HA (hydroxyl-apatite) and 30% β-TCP (tri -calcium phosphate) have historically been utilized to enhance periodontal regeneration. Platelet-rich fibrin (PRF) has emerged as a promising biomaterial in tissue and bone regeneration by stimulating cell proliferation, migration, and differentiation.[6]

Case Report

A systemically healthy 30-year-old male patient came to the department of Periodontics, GDC Indore, with the chief complaint of swelling of gums in his lower right back tooth since 2 -3 days. The patient gave history of food lodgement and moderate pain in the same region since 3 months. Upon intraoral examination, a periodontal abscess was identified in relation to tooth #46. A deep periodontal pocket of 8 mm was measured using a UNC-15 periodontal probe, and grade II

furcation involvement was assessed using a Naber's probe (figure 1). Additionally, a distal proximal carious lesion was evident on tooth #46. The tooth was tender on chewing and sensitive to percussion. The oral hygiene was fair. Radiographic examination revealed a disto-proximal carious lesion approaching the pulp, accompanied by widening of the periodontal ligament space and a radiolucent area in the furcation region (figure 2).

A diagnosis of primary endodontic with secondary periodontal lesion w.r.t #46 as per classification proposed by Simon et al. 1972 was made.[7] Therefore, a multi-disciplinary approach involving first endodontic and later periodontal regenerative surgery was planned. Written informed consent was obtained from the patient, ensuring his full understanding of the treatment plan.

The pus was carefully drained from the pocket and sub-gingival irrigation with metronidazole was done. Patient was kept on antibiotics and analgesics for 5 days and proper oral hygiene instructions were given. Subsequently, the patient was recalled after a week and a thorough supra and sub-gingival scaling and root planning was done.

The patient was re-evaluated after 1 week. Endodontic treatment was taken up first and the patient was followed up for 3 months. At the end of third month, IOPA was taken with #46 which showed that the furcation involvement still prevailed, though the periodontal pocket reduced from 8mm to 6mm clinically. Therefore, periodontal regenerative surgery using alloplast bone-graft along with PRF membrane was planned for treatment of furcation defect.

Figure 1: Disto-proximal caries and periodontal abscess with #46

Figure 2: Radiograph showing furcation involvement w.r.t #46

Surgical Procedure

Following adherence to aseptic protocols and sterilization, the surgical procedure was planned. Anesthesia was administered using xylocaine with 1:80,000 adrenaline. A full-thickness envelope flap was raised buccal and lingually through an intra-crevicular incision extending to one tooth on either side of #46 (figure 3).

Figure 3: Intra-crevicular incision w.r.t #45,46 and 47

The full-thickness flap was elevated up to the base of the furcation defect, followed by a split-thickness flap beyond the mucogingival junction to facilitate coronal flap positioning, which allowed complete coverage of the defect and the graft material. After flap reflection, thorough debridement of the defect was performed using Gracey curettes #13 and #14 and mini curettes, along

with comprehensive scaling and root planing of the exposed root surfaces (figure 4).

Figure 4: Surgical exposure of furcation defect

Alloplast bone graft (70% HA and 30% β-TCP) with the particle size of range 250-550 microns was placed and stabilized in the furcation area (figure 5). The graft and the furcal defect was covered with PRF membrane (figure 6). PRF was prepared with required quantity of blood drawn in 10 ml glass test tubes without an anticoagulant and centrifuged immediately using a tabletop centrifuge for 10 minutes at 3000 rpm.[7]

Figure 5: Bone-graft placed in the furcation defect

Figure 6: PRF membrane adapted over the furcation defect

Primary soft tissue closure of the flap was done with non-resorbable black silk (4-0) suture using vertical mattress and interrupted suturing technique. The patient was instructed on appropriate plaque control measures and prescribed a 0.12% chlorhexidine mouthwash to be used for rinsing twice daily. Sutures were removed 10 days postoperatively.

Resolution of the inflammation and a reduction in probing pocket depth from 6mm to 3mm was observed 6 months post-operatively (figure 7 and 8). Sequential radiographs revealed considerable radio-opacity suggestive of bone fill in the furcal region w.r.t. #46.

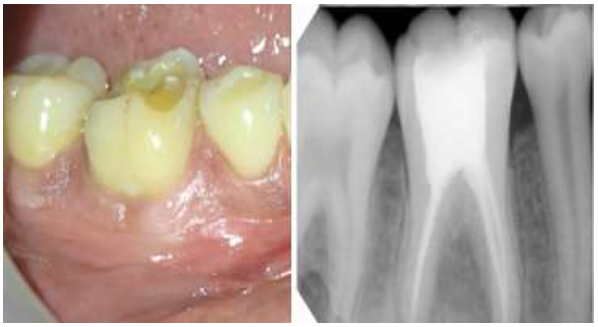

Figure 7: post-operative at 6 months

Discussion

Endo-periodontal lesions, particularly those involving the furcation of molars, present a significant challenge for dentists due to the complexity of the tooth's anatomy. The presence of furcation defects, concavities, and a longer root trunk, combined with the tooth's distal location in the arch, makes it difficult for patients to maintain adequate oral hygiene. This often leads to a higher risk of endo-periodontal lesions and subsequent tooth loss. Successful management requires a comprehensive understanding of the etiology, diagnosis, treatment plan, and prognosis.

A staged approach, involving endodontic therapy followed by periodontal surgery, is often necessary for optimal outcomes. While successful endodontic treatment often resolves the endodontic component, the long-term prognosis is heavily influenced by the success of periodontal repair or regeneration.[8] Bogdan R (2021) has emphasized that a successful root canal treatment, including proper debridement, obturation, and sealing of lateral and accessory canals, helps to prevent the re-entry

of bacteria and other microorganisms into the root canal system. This reduces the risk of recurrent endodontic infections, which can further exacerbate the defect.[9]

Post-endodontic radiographic evaluation at three months revealed persistent radiolucency in the furcation region, despite a reduction in periodontal pocket depth from 8 mm to 6 mm. This observation confirmed the presence of secondary periodontal involvement alongside the primary endodontic condition. Hence; endodontic therapy was followed by periodontal surgery.

Perlmutter S et al. reported that root canal treatment to be performed 2.5 months before periodontal surgery not to impair periodontal healing.[10] Similarly, in a case series published by Aksel H et al. (2014), one case with primary endodontic and secondary periodontal lesions was reported. Endodontic treatment was administered followed by periodontal surgery after 3 months.[11]

Furcation treatment outcomes with open flap debridement and bone grafting depends mainly on the vertical and horizontal component of bone loss and intact buccal and lingual cortical bone plates.[12] Parolia et al. (2013) have reported a success rate 77.5% in the treatment of endo-perio lesions using regenerative techniques. In contrast, the success rate without regenerative interventions ranges between 27% and 37%.[13] Oh et al. (2019) reported the survival rate of the teeth with endo-periodontal lesions after periodontal regenerative procedures after 5 years follow up was 92.31%.[14]

In the present case, regenerative approach using composite bone graft and PRF was used for management of mandibular grade II furcation defect. The advantage of composite bone graft (β-TCP and HA) lies in its biocompatibility and dual resorption properties. The faster resorption of β-TCP facilitates bone mineralization, while the slower resorbability of HA provides a scaffold for bone ingrowth and calcification.[15] PRF, autologous platelet concentrate, rich in growth factors like platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β) helps in wound healing and periodontal tissue regeneration.[14] Kaur R et al. (2022) in his clinical study assessed the use of alloplast and PRF for furcation defect treatment and found significant improvements in PPD (5.2 ± 1.3 mm vs. 3.0 ± 1.6 mm) and CAL gain (3.7 ± 1.3 mm) CAL (4.2 ± 1.3 mm) HPD and VPD (4.2 0 ± 1.6 mm) as well as radiographic bone fill (77.5% ± 1.8 mm). Combination of bone graft and PRF was shown to promote faster healing and better periodontal regeneration compared to bone graft alone .[16]

The results post 6 months has shown a significant amount of bone fill in the furcation area of the treated tooth along with gain in clinical attachment level.

Conclusion

Regeneration in endo-perio lesions is a complex process that requires a multidisciplinary approach. By addressing both the endodontic and periodontal components and utilizing appropriate regenerative techniques, clinician can improve the chances of successful healing enhancing the long-term success of treatment. Combining regenerative approaches with traditional endodontic treatment provides an effective strategy for managing complex endo-perio lesions, restoring both the function and aesthetics of the involved teeth.

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