



# Endodontic Management of a Mandibular First Molar with concomitant Pulpal and Periodontal Disease with Conservative Postendodontic Restoration with CAD/CAM Onlay: A Novel Clinical Technique

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Submitted: 15-06-2022

Accepted: 25-06-2022

## ABSTRACT

Restoration of endodontically treated teeth is important for the success of endodontic treatment. In full coverage restorations, maximum amount of tooth structure is compromised, so as to conserve the amount of tooth structure partial coverage restorations, can be preferred.

In this case report the management of a concomitant endodontic-periodontal lesion case is described. A 27-year-old patient presented with symptomatic apical periodontitis of tooth #46 due to hidden caries and a generalized aggressive periodontitis. After endodontic treatment, composite material was used as postendodontic restoration. The tooth was then prepared to receive a ceramic onlay and bonded with self-adhesive universal resin cement.

**Keywords:** Concomitant; endodontics, endo-perio lesion, multidisciplinary approach, CAD CAM ceramic onlay.

## I. INTRODUCTION:

The tooth, the pulp tissue and its supporting structures should be viewed as one biological unit. The inter relationship of these structure influence each other during health, function and disease.<sup>1</sup>

**Simring and Goldberg** first described the relationship between periodontal and endodontic disease, in 1964.<sup>2</sup> The relationship between pulpal and periodontal disease can be traced to embryological development, since the pulp and the periodontium are derived from a common mesodermal source.

The dental pulp and the surrounding periodontium communicate through dentinal tubules, lateral canals, developmental grooves and apical foramina, which are potential portals for transmission of disease between both tissues. Diagnosis and therefore differentiation of endodontic and periodontal diseases is challenging

because they may have similar clinical characteristics and may impact each other.<sup>3</sup>

Several classifications have been suggested for periodontal-endodontic lesions. Torabinejad & Trope classified them as endodontic origin, periodontal origin, combined endodontic-periodontal lesions, separate endodontic and periodontal lesions, lesions with communication or lesions without communication.<sup>4</sup> A recent classification categorized lesions based on the primary disease with its secondary effect into retrograde periodontal disease (either as primary endodontic lesion with drainage through the periodontal ligament or primary endodontic lesion with secondary periodontal involvement), primary periodontal lesion, primary periodontal lesion with secondary endodontic involvement, combined endodontic-periodontal lesion, or iatrogenic periodontal lesions.<sup>5</sup>

However, a commonly used classification categorizes endodontic-periodontal lesions as Primary Endodontic lesions, Primary Periodontal lesions and Combined lesions.<sup>6</sup> Another category, Concomitant Pulpal and Periodontal lesions, was added later and includes the two separate lesion types simultaneously in which both disease states exist but with different causative factors and with no evidence that either disease has influenced the other.<sup>7</sup> The combined endodontic-periodontal lesions were investigated; thus, different treatment strategies were described.<sup>8-10</sup> Oh et al. proposed the following 4-phase treatment algorithm: (i) pre-surgical (determining periodontal/regenerative prognosis), (ii) endodontics, (iii) periodontal surgical, and (iv) post-guided-tissue regeneration reevaluation protocol.<sup>8</sup> Tseng et al. reported treatment of a true combined endodontic-periodontal lesion<sup>11</sup> by a nonsurgical root-canal-retreatment followed immediately by a periodontal treatment including guided tissue regeneration. Karabucak and Setzer treated two cases;

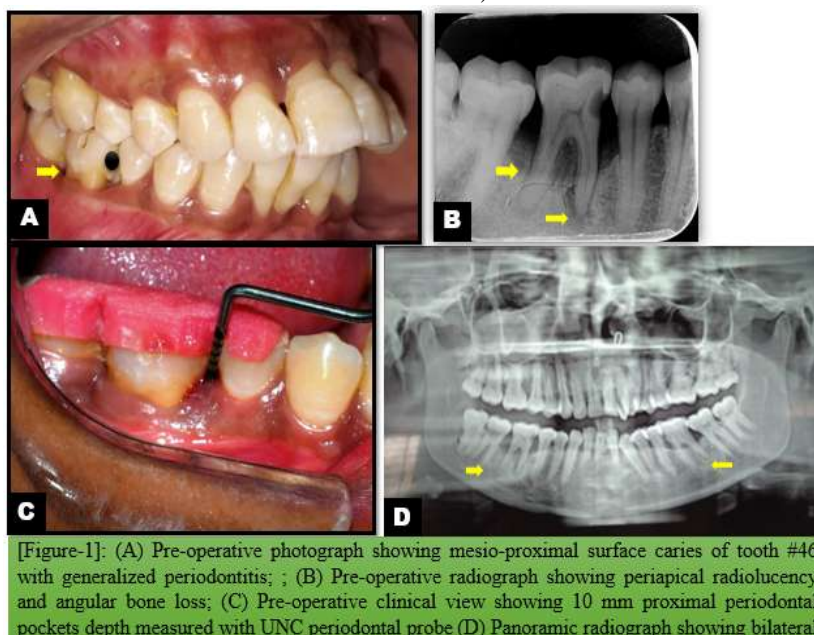


confirming the effectiveness of an apical surgery supported by periodontal guided tissue regeneration.<sup>12</sup> The aim of this work is to describe the multidisciplinary clinical management of a concomitant endodontic-periodontal lesion.

## II. CASE REPORT:

A 27-year-old female patient reported to the Department of Conservative Dentistry and Endodontics Bareilly International University Bareilly, with a chief complaint of spontaneous pain in the region of mandibular right first molar since 1 year.

Patient's medical history was non-contributory. Clinical examination revealed discoloured mesio-occlusal surface of tooth #46 with intact occlusal anatomy. Tooth was tender to percussion and gave no response to cold test. Pre-operative radiograph showed mesio-proximal radiolucency involving the pulp. Teeth #46 had 10 mm proximal periodontal pockets (Figure 1C) and showed grade-1 mobility. Radiographic examination revealed peri-apical radiolucency with #46 (Figure 1B) and severe vertical bone loss at the proximal area between teeth #45 & #46 and the mesial area of #47 (Figure 1B)



Based on clinical and radiographic findings, a diagnosis of generalized aggressive periodontitis with symptomatic irreversible pulpitis and apical periodontitis was made. The treatment plan involved saving tooth #46 and included the following stages:

### 1-Initial Periodontal Treatment:

Full-mouth scaling and root planing was done.

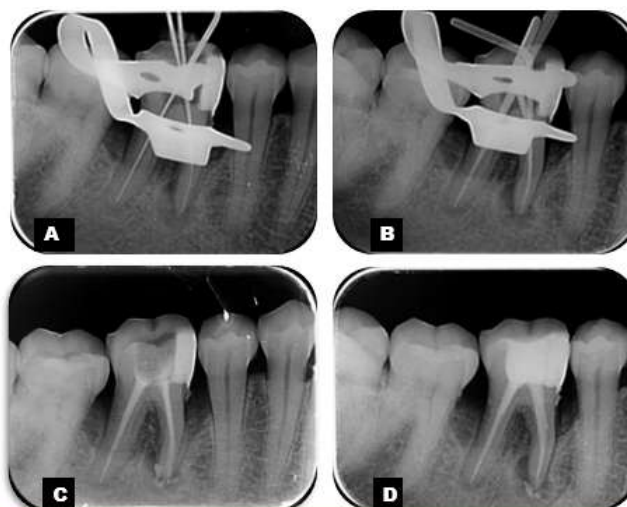
### 2-Endodontic Treatment (tooth #46):

Treatment plan comprised of root canal treatment followed by surgical periodontal treatment.

Endodontic access cavity in tooth #46 was prepared under rubber dam isolation and profound anesthesia. The access cavity was made and working length of all three canals i.e. mesio-buccal, mesio-lingual and distal canal was determined using an apex locator (Propex II, DentsplyMaillefer) and confirmed

radiographically (Figure 2A). The curved and narrow distolingual canal was first negotiated with small and flexible hand K-files and gradually enlarged to ISO size 15.

Further cleaning and shaping was performed with Neo-endo nickel-titanium rotary file system 13/2%, 16/2%, 19/2% up to 25/4% in mesial canals and 30/4% in distal canals. Copious irrigation was performed with 5% sodium hypochlorite solution, 17% EDTA (Glyde, DentsplyMaillefer) and final flush with sterile saline solution. Canals were dried with sterile paper points and fit of the master cone was verified radiographically (Figure 2B). Obturation was done with gutta percha cones (Dentsply, Maillefer) and AH Plus resin sealer (DentsplyDeTrey, Konstanz, Germany) and was verified radiographically (Figure 2C).



[Figure-2]: Endodontic procedure radiograph; (A) Working length radiograph; (B) Master cone radiograph after cleaning and shaping; (C) Post- Obturation radiograph; (D) Post-operative radiograph

Following obturation, access cavity was cleaned to remove residual sealer and debris from the walls. Access cavity was etched with 37% phosphoric acid (Conditioner 36, DentsplyDeTrey) for 15 seconds and rinsed with distilled water. Cavity was blot dried and total etch adhesive (Prime and Bond NT, Dentsply Caulk, Milford, DE, USA) was applied with an applicator tip. Excess primer was removed with a gentle air stream and light cured for 20 seconds with a halogen curing light (Woodpecker LED Curing Light; Gulin Woodpecker Medical Instrument Co., Ltd., Guangxi, China). Access cavity was filled with composite (Ever X Posterior, GC Dental Products Corp., Aichi, Japan) restoration in 2mm increments and light cured for 40 seconds. Post endodontic restoration was verified radiographically (Figure 2D).

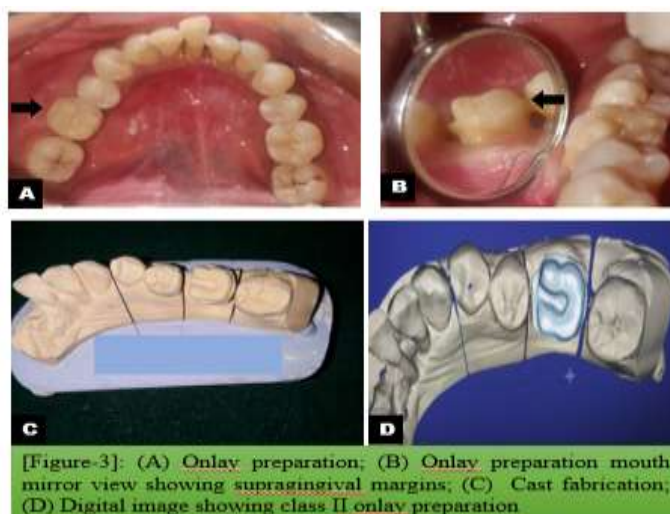
### 3-Surgical Periodontal Treatment:

Following local anaesthesia, a Crevicular incision was given extending from tooth #45 to mesial surface of #47 and a flap was reflected to perform periodontal debridement and granulation tissue removal. After that I-PRF and Bone graft (HA) known as sticky bone placement was done. The flap was replaced, Simple interrupted suture was given and a post-surgery radiograph was taken, after placement of coe-pack. Six months post periodontal surgery, good healing of periapical and periodontal tissues of tooth #46 was observed

clinically and radiographically. The 3-month post-periodontal surgery clinical and radiographic follow-up revealed normal response of teeth #46 to palpation and percussion, normal mobility, improved periodontal and almost complete healing of the mesial root lesion and a significant reduction of the distal root lesion.

### 4-Tooth preparation for ceramic (monolith zirconia) onlay and impression making:

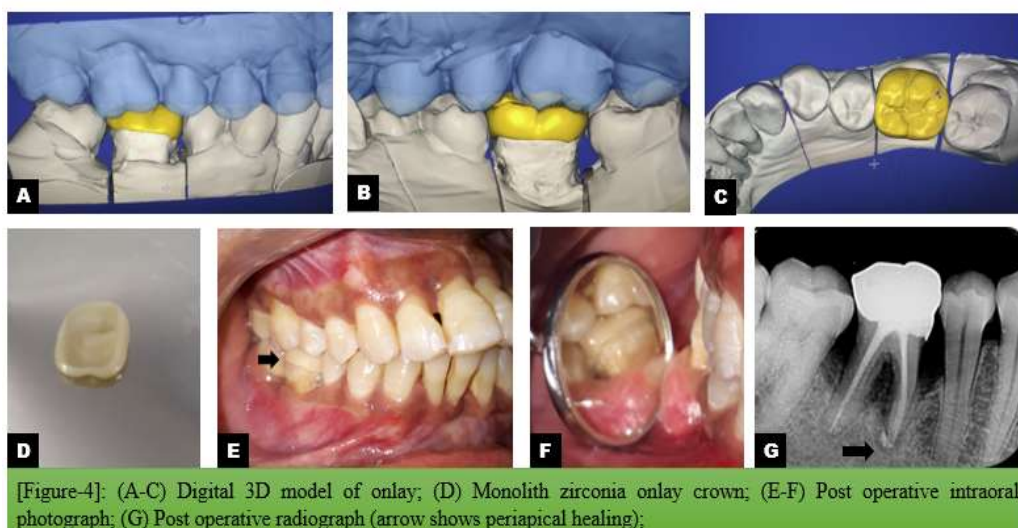
Tooth preparation for a Class II ceramic onlay and tooth collar was done as conservatively as possible using crown and bridge preparation kit (Shofu, Crown and Bridge Preparation Kit) for auxiliary retention [Figure-3A]. Cuspal reduction was done in the form of capping rather than shoeing. Internal angles were made rounded to enhance adaptation of restorative material. Depth orientation grooves are placed on the cusps. 1.5-2.0 mm of occlusal clearance was done to prevent fracture in all excursions. A distinct heavy chamfer was placed on the facial and lingual surfaces with supragingival margins [Figure-3B]. Smooth, distinct margins are essential for an accurately fitting ceramic onlay restoration. The pulpal and gingival floors were made smooth, and the buccolingual walls of the mesial proximal box were finished with a fine flame-shaped diamond (ie, Axis Dental, Coppell, TX). Adequate clearances were created for easy seating and finishing of the margins.



Impressions of both the arches were made and sent to the laboratory for the fabrication of CAD/ CAM based ceramic onlay). Temporary restoration was cemented with a eugenol-free temporary cement. As esthetics is one of the prime concern for the patient, ceramic/zirconia monolith (czar) was selected for the fabrication of the ceramic restoration.

#### 5-CAD/CAM ceramic onlay fabrication and cementation:

In laboratory onlay preparation was scanned with a 3-dimensional scanner (AmannGirrbach GMBH, Pforzheim, Germany) and the processed data was superimposed on the preparation [Figure-3D). A digital 3-D model of onlay was designed[Figure-4 A-C] and input was send to the milling machine.A zirconia monolith was milled to fabricate the onlay[Figure-4 D].



In the next treatment visit, ceramic onlay was cemented using glass ionomer cement (GC Luting and Lining Cement, GC America Inc.) according to manufacturer's recommendations [Figure-4 E-F].





A 6months' follow-up showed hard tissue and soft tissues within normal limit with no clinical sign and symptom[Figure-5].

### III. DISCUSSION:

Proper management of endodontic-periodontal lesions requires precise diagnosis and identification of aetiological factors. This case presented a treatment of a concomitant pulpal-periodontal lesion. This disease may progress undiagnosed, and the treatment is rendered to only one of the diseased tissues; thus, the other may respond favourably. Management of such lesions necessitates dealing with both diseases concomitantly<sup>13</sup>.

For this case, the chief complaint was pain on biting on the right area, which suggests the presence of an apical or periodontal disease. Clinical investigation revealed tenderness of tooth #46 on percussion, periodontal pockets and halitosis. The radiographic examination showed apical radiolucency of tooth #46 and vertical bone loss on both side in that area. The case was diagnosed as tooth (#46) with symptomatic apical periodontitis associated with generalized aggressive periodontitis.

The treatment of generalized aggressive periodontitis included several surgical and non-surgical procedures supplemented by antibiotics.<sup>10</sup> Observing good healing of the endodontic lesion prior to the regenerative periodontal surgery was promising; creating a favourable environment for periodontal repair by bonegrafting and membrane.<sup>14</sup> One year post-endodontic intervention (6 months after the final periodontal surgery), a healed apical lesion of the mesial-root was noticed with significant reduction of the mesial-root lesion and bone formation at the periodontal bone defect.

Conventional triangular access opening in such cases with involving proximal surface may additionally weaken the tooth structure<sup>15</sup>. Therefore, restorative needs of such cases should

be given special attention to preserve the remaining tooth structure.

The restorative needs of the posterior teeth are different from that of anteriors because of variability in the magnitude and direction of forces acting on the molars. Long-term retention of the endodontically treated teeth and resistance to fracturing are directly related to the amount of residual tooth structure.<sup>16</sup> Preservation of Pericervical Dentine (PCD) is of utmost importance in endodontically treated teeth. PCD is a critical zone, 4mm above the crestal bone and extending 4mm apical to the crest. Preservation of pericervical dentine provides optimum strength and fracture resistance to endodontically treated teeth.<sup>17</sup> Although bonded restoration is the most conservative treatment option, it is unacceptable for endodontically treated teeth with lost marginal ridge.<sup>18</sup> If the cuspal width to length ratio of the tooth is more than 1:2, an onlay can be placed as the partial coverage restorations preserves more tooth structure than full coverage crowns and provides sufficient fracture resistance as compared to direct bonded restorations.<sup>19</sup> In this case report, post-endodontic restoration was done with metal onlay instead of full coverage crown to preserve the sound tooth structure.

CAD/CAM based restoration was selected for this case to replicate patient's original tooth anatomy in the final restoration. Moreover, digital scanning and designing results in more accurate marginal adaptation than conventional casting procedure.<sup>20</sup> Ceramic restoration was chosen over the metal restoration due to aesthetic concern of patient and. This technique combined the benefits of contemporary materials (FRC) and recent technology(CAD/CAM) to replicate original tooth form and anatomy. This technique offers various advantages such as conservation of tooth structure, no occlusal interference, better fit of the restoration, reinforcement of the tooth structure and supragingival margin preserving the periodontal health. Also, the restoration is more conservative and less expensive than full coverage restorations.



#### IV. CONCLUSIONS:

Eliminating possible aetiological factors and a multidisciplinary approach are essential factors for successful management of endodontic-periodontal lesions. Recent advances in endodontic armamentarium and materials offer better control and precise management of the disease.

Therefore, endodontic cases of hidden caries spreading beneath an intact enamel surface can be managed conservatively using CAD/CAM technology.

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