Orthodontic Management of a Migrated Maxillary Central Incisor With a Secondary Occlusal Trauma

Laurent A.M. Thierens,∗† Tommie Van de Velde† and Guy A.M. De Pauw∗

Introduction: Normal or excessive occlusal forces exerted on teeth with a reduced periodontal support might result in a secondary occlusal trauma. This type of injury is diagnosed based on histological changes in the periodontium. Multiple clinical and radiographic indicators are, therefore, required as surrogates to assist the presumptive diagnosis of a (secondary) occlusal trauma.

Case Presentation: In this case report, the diagnosis, management, and the 1-year follow-up of a secondary occlusal trauma of a maxillary central incisor are described. The occlusal relationship was rehabilitated with fixed orthodontic appliances and was further stabilized with both fixed and removable retainers.

Conclusions: A combined periodontal-orthodontic approach for a secondary occlusal trauma allows the rehabilitation of periodontal, occlusal, and esthetic parameters. Twelve months after the end of the active orthodontic treatment, a combination of fixed and removable retainers showed to be effective in retaining the treatment outcome. Clin Adv Periodontics 2019;00:1–7.

Key Words: Chronic periodontitis; dental occlusion; fixed; orthodontic appliances; traumatic.

Background
Secondary occlusal trauma is injury resulting in tissue changes from normal or excessive occlusal forces applied to a tooth with reduced periodontal support.1,2 It occurs in the presence of attachment loss, bone loss, and normal/excessive occlusal force(s); it is associated with stage IV periodontitis.3,4

Definitive diagnosis of occlusal trauma is not possible without block section biopsy. However, multiple clinical and radiographic indicators can support the presumptive diagnosis of this injury. These indicators include progressive tooth mobility, fremitus, occlusal discrepancy, wear facets (caused by tooth grinding), tooth migration, tooth fracture, thermal sensitivity, root resorption, cement tear, and widening of the periodontal ligament space upon radiographic examination.4–6

doi: 10.1002/cap.10070
Elimination of occlusal trauma can be an important adjunct therapy in the comprehensive treatment of periodontal disease. However, the evidence linking occlusal adjustment to the improvement in periodontal parameters is limited. It might be presumed that orthodontic management can play a prominent role in this context by eliminating adverse occlusal interferences. After all, teeth with a reduced but healthy periodontium can undergo successful tooth movement without compromising the supporting periodontal tissues.

In this case report, the management of a secondary occlusal trauma of a maxillary incisor with fixed appliances (FA) exerting light forces is described.

Clinical Presentation
A 42-year-old male white patient with an unremarkable medical history was referred in December 2015 by the periodontist for orthodontic advice. His oral hygiene was good and all permanent teeth except the third molars were present. Since June 2015, the patient had successfully undergone initial therapy for generalized periodontitis, and he had quit smoking. All pockets were \( \leq 3 \) mm, except for the upper left central incisor (#9). This element still presented a localized pseudopocket of 6 mm, increased mobility (Grade 2), tenderness to percussion, fremitus, and pain on chewing. The vitality test was inconclusive and there was an increased thermal sensitivity. The clinical and radiographic conditions are presented in Figures 1 through 3.

Regarding the multiple clinical and radiographic indicators, the condition of tooth #9 was diagnosed as a localized, severe periodontal lesion with moderate progression due to secondary occlusal trauma.
Case Management

After an interdisciplinary consultation, a root canal treatment of tooth #9 was planned and subsequently performed in January 2016 (Fig. 4). Periodontal treatment consisted of frequent supragingival instrumentation, localized subgingival scaling and root planing around tooth #9, and the elevation of a mucoperiosteal flap to remove the periodontal pocket at the mesial side. Orthodontic treatment was started in March 2016. After 5 months, arch leveling and alignment were completed (Figs. 5 and 6) and a 0.016 × 0.016-inch stainless steel wire was inserted. Figure 7 shows the intermediate radiographic evaluation. Before the start of the space closure in the upper arch, the Curve of Spee in the lower arch was completely leveled to reduce the heavy incisal contacts.

Interproximal reduction of the lower incisors was performed to facilitate retraction, and to subsequently allow complete space closure in the upper arch. First, contact points were reduced using double-sided, aluminum oxide-coated separation strips with a 0.2-mm thickness. The triangular shape of the incisors was further reduced using a double-sided, diamond-coated stripping disk with a 0.3-mm thickness, and finally the enamel was polished with fine and extra fine contouring and polishing disks. The interproximal spaces were closed with elastomeric chain (Fig. 8). Prophylaxis was performed at every orthodontic appointment. Additionally, the patient had an appointment with the periodontist every 3 months. The patient gave oral consent for all procedures.

Clinical Outcomes

After 22 months, the FA were removed. Complete alignment and space closure were accomplished. An adequate overbite and balanced incisor relationship were achieved. The labial recession of tooth #9 had decreased to 1 mm and the probing depth halved to 3 mm (Figs. 9 and 10). Radiographically, trabecular bone can be detected at the mesial and distal side of tooth #9. The periodontal ligament space is still widened (Fig. 11). A lingual retainer (CoAx 0.0195 inch) was bonded in the upper arch (#7 to #10) and the lower arch (#22 to #26) (Figs. 9 and 10). A vacuum formed retainer was also provided in both arches. The 1-year follow-up shows stable clinical and radiographic results (Figs. 12 through 14).

Discussion

Several other treatment strategies could be pursued to rehabilitate the dentition of this patient, such as an implant supported crown or a partial removable denture. However, the orthodontic approach was the only one rehabilitating the unbalanced incisor relationship. The notable compliance and motivation of our patient, essential for an intensive orthodontic treatment, were ultimately decisive.

Melsen and coworkers and Cardaropoli and coworkers concluded that low forces between 5 and 15 g per tooth are sufficient to achieve successful tooth movement in periodontal compromised patients, especially when performing intrusion of incisors. They observed radiographically that the total amount of alveolar support was unaltered or even increased after orthodontic therapy. Cardaropoli and coworkers also observed a reduction of the probing depth and clinical crown length, and absence of bleeding after a combined periodontal-orthodontic approach. The evolution of the periodontal parameters and the alveolar bone surrounding tooth #9 in this case is in line with their conclusions.

‡Horico Dental, Berlin, Germany.
§Komet Dental, Lemgo, Germany.
∥Sof-Lex, 3M Oral Care, St. Paul, MN.
Intrusion of maxillary incisors that have migrated due to periodontal disease is still controversial. Periodontally involved teeth show bacterial infiltration in dentin tubuli as well as the dental pulp.\textsuperscript{13} These teeth can act as bacterial reservoirs from which decolonization of mechanically treated root surfaces can occur. This can possibly cause more periodontal problems when intruding these teeth apically. Notwithstanding, histologic studies have also shown that the intrusion of periodontally involved teeth may lead to a noticeable gain in connective tissue attachment with adequate oral hygiene and supportive periodontal therapy.\textsuperscript{14}
Conclusions

A combined periodontal-orthodontic approach for a secondary occlusal trauma allows the rehabilitation of periodontal, occlusal, and esthetic parameters. Twelve months after the end of the active orthodontic treatment, a combination of fixed and removable retainers showed to be effective in retaining the treatment outcome.
FIGURE 12 Frontal view of the clinical situation 1 year after bracket removal. The occlusion and esthetic parameters are stable.

FIGURE 13 Lateral and occlusal views of the clinical situation 1 year after bracket removal. The occlusion and periodontal condition are stable.

FIGURE 14 Radiographic view 1 year after bracket removal (after image). The periodontal ligament space has reduced in comparison with Fig. 11.

FIGURE 15 Lateral and occlusal views of the clinical situation 1 year after bracket removal. The occlusion and periodontal condition are stable.
Summary

Why is this case new information?
■ To our knowledge, this case report is presumably the first to describe this type of pathology with a substantive follow-up period.

What are the keys to successful management of this case?
■ Interdisciplinary consultations are essential to perform adequate diagnostics and to set up a feasible treatment plan.

What are the primary limitations to success in this case?
■ A combined periodontal-orthodontic approach is not an instant solution and requires profound patient motivation.

Acknowledgments
The authors would like to thank Helene Van kerkhoven (private dental office MOND, Antwerp, Belgium) for her advice and the performance of the endodontic treatment. No funding was obtained for this study. Laurent Thieren, Guy De Pauw, and Tommie Van de Velde report no conflicts of interest related to this study.

CORRESPONDENCE
Laurent Thieren, Oral Health Sciences, Department of Orthodontics, Ghent University, Corneel Heymanslaan 10, Ghent 9000, Belgium. E-mail: laurent.thieren@ugent.be

References