

Causation of Abfraction by Sole Lateral Excursive Movement on the Affected Tooth: A Case Report

Priyake D. Palipana*¹, Isharajini P. S. Gamage², Puthula N. Palipana³, K.A.D.G. Harshika⁴

¹Department of Restorative Dentistry, Faculty of Dental Sciences, University of Sri Jayewardenepura, Sri Lanka

²Teaching Hospital, Kalutara, Sri Lanka

³Sri Lanka Navy, Sri Lanka

⁴Department of Paraclinical Sciences, Faculty of Dental Sciences, University of Sri Jayewardenepura, Sri Lanka

Corresponding author*: priyakepalipana@sjp.ac.lk

Abstract: This case report elucidates an isolated abfraction lesion in a maxillary right molar tooth in a 19-year-old female. The affected tooth is the only tooth involved in the lateral mandibular excursion to that side. The lesion manifested as severe sensitivity to cold stimuli. It was attributed to eccentric occlusal forces causing flexural fatigue at the cervical margin. Diagnostic evaluation included clinical examination, sensibility testing, and radiographic assessment, confirming no caries or periodontal disease. Management involved enameloplasty of the functional cusp to redistribute occlusal load toward group function, followed by restoration with Resin-Modified Glass Ionomer Cement (RMGIC). Follow-up at 2 weeks, 3 months, and 6 months showed complete resolution of symptoms and intact restoration. This case underscores the biomechanical etiology of abfraction, highlighting the role of isolated lateral guidance in lesion development, and supports a multifaceted approach combining occlusal adjustment and restorative intervention for an enduring outcome.

Keywords- Abfraction; non-carious cervical lesions; occlusal trauma

I. INTRODUCTION

Abfraction lesions are Non-Carious Cervical Lesions (NCCL) occurring at the cervical margins of teeth. They are typically characterized by their wedge-shaped defects [1]. The etiology of abfraction lesions is multifactorial [2]. Extensive occlusal forces, particularly those involving eccentric loading and lateral guidance, are commonly implicated in the development and progression of such lesions [3]. It is postulated that the above-mentioned excessive loading forces lead to flexural fatigue and microfractures in the cervical enamel and dentin.

Recent literature emphasizes the debate surrounding abfraction's primary etiology. While some studies support a dominant biomechanical role, others argue for a multifactorial model where abrasion (e.g., from aggressive toothbrushing) and erosion (e.g., from acidic diets) exacerbate stress-induced defects [1,3]. In most physiological circumstances, the canine guidance is usually involved in lateral excursion. Otherwise, it is the group function where many teeth are involved in the guidance. Canines with large roots can bear the weight of the mandible [4]. In contrast, when a different tooth, is involved as the sole tooth in lateral excursion, the occlusal stress cannot be adequately borne by the tooth. With repeated exposure to concentrated, extensive occlusal stress, localized structural fatigue at the cervical margin leads to abfraction lesions.

Epidemiologically, abfraction lesions affect 27-85% of adults, with a higher incidence in individuals with bruxism, malocclusion, or parafunctional habits [5]. The case report presents an isolated abfraction lesion in a maxillary right first molar that was involved as the exclusive guiding tooth during the lateral excursion. The case report validates the possible role of eccentric forces in the etiology of abfraction and the

importance of a comprehensive occlusal assessment in diagnosis and treatment planning.

The affected tooth is restored with Resin Modified Glass Ionomer Cement (RMGIC), chosen for its fluoride release, adhesion, and stress-buffering properties [6], following correction of the lateral guidance.

II. CASE REPORT

A 19-year-old female attended the Restorative Dental Clinic in the Dental Professorial unit at the Colombo South Teaching Hospital, Sri Lanka. The patient had been severely sensitive to cold water for the last three weeks.

Past medical history is not significant. The patient looked healthy, her face was symmetrical, and there was no deviation of the mandible in the opening. There was no tenderness over the temporomandibular joint on both sides.

Intraoral examination revealed that the first incisor to the second molar teeth were present in all four quadrants. None of the teeth had dental caries. Oral hygiene was acceptable with no calculus deposits. Basic Periodontal Examination (BPE) showed a code 2 recording in all sextants.

Blowing air along the upper premolar and molar region in the upper right quadrant led to severe sensitivity, revealing a deep groove near the cervical margin of the upper right first molar tooth. There were no similar lesions in any other teeth. Examination revealed that the lateral excursion of the mandible to the right-side is guided solely by the upper right first molar.

Clinical photograph showing a wedge-shaped cervical defect located at the cemento-enamel junction (CEJ) in the maxillary first molar tooth in the right side. The lesion demonstrates the characteristic morphology of an abfraction lesion, with a sharp "V" shape, well-defined margin, and loss

of cervical tooth structure. It was consistent with stress-induced non-carious cervical lesions.



Fig. 1. Abfraction lesion on the maxillary first molar



Fig. 2. Lateral guidance mechanics

Clinical photograph illustrating mandibular movement during lateral excursion, depicting the first molar tooth is the only maxillary tooth involved in lateral excursion mandibular movement due to the absence of canine guidance.

This occlusal pattern demonstrates how lateral occlusal forces are transmitted to the molar tooth, contributing to increased stress concentration at the cervical region and the development of abfraction lesions.

Sensibility test using “Endo frost” revealed an equal positive response from the second premolar, first molar and second molar teeth. A periapical radiograph of the upper right first molar showed no pathological lesion in the tooth or the surrounding hard tissues.

It was diagnosed as an abfraction lesion in the upper right first molar associated with lateral excursion of the tooth, without affecting the rest of the teeth. The patient and the parent were informed about the possible aetiology. It was suggested to have a Resin Modified Glass Ionomer Cement (RMGIC) restoration of the abfraction lesion. Enameloplasty, intending to have a group function in the upper right quadrant associated with the lateral excursion, was also suggested.

Enameloplasty was performed to minimize overloading of the first molar tooth without any dentine exposure. The buccal surface of the upper first molar was polished, washed, and cleaned. Conditioning of the abfraction lesion was done with a weak acid.

RMGIC Cement (Fuji) was placed into the lesion. The restoration was contoured and light-cured.

Once the material was set, restoration was further contoured and polished.



Fig. 3.1. Post-restorative appearance of the maxillary right first molar tooth



Fig. 3.2. Post corrective lateral guidance

The patient was summoned in two weeks for assessment. At the review, it was revealed that she did not have any sensitivity, and it was quite comfortable. Blowing air around the molars of the upper right quadrant did not precipitate any pain or sensitivity. Subsequent reviews in 3 months and 6 months also revealed the patient to be comfortable and free of symptoms. Restoration was intact, and there was group function during mandibular excursion to the right side.

III. DISCUSSION

The theory of abfraction suggests that tooth flexure arising from occlusal loads causes the formation and progressive loss of tooth substance at the cervical margin. This etiology was originally proposed by Grippo in 1991.

The suggested etiology was subjected to considerable debate. Abfraction emphasizes the type of tooth flexure

associated with excessive occlusal stress and leading to the breakdown of tooth substance at the cervical margin. The presence of an abfraction lesion, especially in a tooth with a distinct occlusal function, such as guiding lateral mandibular movements, supports the biomechanical theory.

In this case, the maxillary first molar, which was the sole tooth involved in lateral guidance, has been subjected to repeated lateral and oblique forces. Unlike vertical (axial) forces, lateral forces create a bending along the tooth structure, which may induce tensile and compressive stresses at the cervical region. With prolonged stress, it will exceed the tooth's structural resilience, leading to enamel microfractures, dentin exposure, and eventual lesion development.

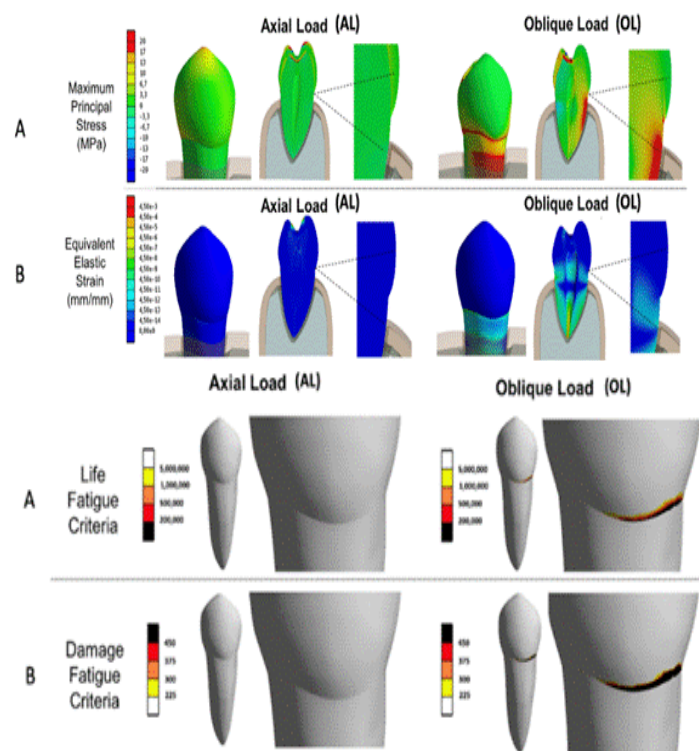


Fig. 4. Finite element analysis of stress and fatigue distribution under different occlusal loading conditions. Adapted from Machado et al. (2025)

The schematic representation based on finite element analysis illustrates the pattern of stress distribution within the tooth during lateral occlusal loading. A clear concentration of tensile and compressive stresses is observed at the cervical region near the cemento-enamel junction. This stress concentration provides a biomechanical explanation for the initiation and progression of abfraction lesions, supporting the theory that eccentric occlusal forces contribute significantly to cervical tooth structure loss.

Canine guidance is generally considered to be ideal due to the canine's long root and favorable anatomical position, which effectively dissipates lateral forces [4]. The absence or loss of canine guidance, as observed in this patient, shifts this occlusal burden to the molar, which may lack the structural robustness to withstand such forces consistently.

Management of these lesions should not be limited to restorative treatment alone. Although restorations can improve

both form and appearance, addressing occlusal factors through measures such as occlusal adjustment, restoration of canine guidance, or orthodontic treatment is necessary to reduce the risk of lesion recurrence and further progression [1].

IV. CONCLUSION

This case demonstrates the role of eccentric occlusal forces, particularly sole lateral guidance, in the pathogenesis of abfraction lesions. Teeth that bear excessive functional load by acting as the sole guide during lateral movements may be more susceptible to stress-related cervical breakdown. Therefore, evaluation of occlusal relationships and functional patterns should form an integral part of the diagnosis and management of non-carious cervical lesions. Correction of occlusal discrepancies is essential to ensure the durability of restorative interventions and to support long-term conservation of tooth structure.

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