

Tooth Abfraction in Relationship to Occlusal Load Stresses: A Case Report

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Abstract: Dental abfraction is non-carious cervical lesion resulting from flexure forces. As the tooth flex under occlusal load, stresses are transmitted to the cervical area, causing the cervical enamel to fracture and dislodge, and with increased flexure, a v- shaped notch develops. The pathogenesis is related to the occlusal stress that causes non-carious lesion in the enamel and dentin at the cervical region. Clinically, it presents as notches in the tooth structure near or even under the gum line usually on the cheek side of tooth. The restoration treatment is made using an aesthetic adhesive material, but we must take into account the causal factors and the specific area where the restoration is done. This report present a case of abfraction which was successfully treated by Composite restoration material.

Keywords: Abfraction lesions; cervical defect; restorative treatment, tooth wear

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I. Introduction

Dental abfraction is the pathological loss of tooth substance caused by biomechanical loading forces that result in flexure and failure of enamel and dentin at a location away from the loading [1]. Abfractions are caused by clenching or grinding, causing v- shaped notches near or even under the gum line, usually on the cheek side of tooth. Although abfraction lesions have a multifactorial etiology, typically abfraction is said to result from forces associated with mastication, swallowing and malocclusion [2].

Cervical coronal tooth destruction involves the loss of a quantity of substance and the most commonly they are caused by the evolution of carious processes. Pathological loss of dental hard substance in the cervical area, which are caused by flexural forces, usually from cyclic loading are called abfraction lesions and they occur as a result of the exercise of excessive force loading of the teeth that are transmitted in the cervical region. At this level horizontal forces flex teeth and consequently cause the appearance of cracks in the enamel prisms by breaking ties of hydroxyapatite crystals [3-5].

The etiopathogenesis of abreaction lesions as tooth wear is likely to be occlusal, being proven that bruxism or other para-functions are associated with the occurrence of this type of cervical lesions [6, 7]. Clinical presentation of abfraction lesions ranged from a minimal loss on hard cervical third of the tooth to extensive lesions with the characteristic of evolution the direction in depth dental pulp. Also the shape of these lesions is specific: triangular, wedge-shaped, with sharp internal and external line angles. The shape and size of the lesion are dictated by the direction, magnitude, frequency, duration and location of forces that arise when teeth come in contact [8, 9].

The abfraction lesions occur in the anterior region including the premolars of the dental arches. affecting a single tooth or, more commonly, a group of teeth when it comes to a par-function with extensive effects. Abfraction primarily leads to dentin exposure, and consequently dental hypersensitivity to physical, chemical and thermal stimuli [10].

The treatment of abfraction lesions is required to prevent dental fractures and pulpal complications. Firstly, the clinician should identify the primary cause of of injuries through medical history and a thorough clinical examination, focusing on possibilities of reduction of occlusal stress of the respective teeth. Restoration of these lesions can be achieved using modern aesthetic materials such as, modern composites resins, glass-ionomer cements, compomers, resin-modified glass-ionomer cements (RMGIC) and calcium hydroxide as liner especially in deep cavities [11, 12]. Out of the above mentioned materials, micro-filled composites are the materials of choice due to their flowable properties and its ability to accommodate as the tooth flexes.

II. Case Report

A 50 year-old male patient presented to dental clinic for tooth restoration. The case showed multiple and extensive tooth wear of the cervical areas of upper anterior region including premolars (Figure no. 1).

The patient reported having sensitivity to physical agents, especially cold drinks. The examination revealed that the source of sensitivity was the presence of exposed dentin. The patient reported having bruxism which was confirmed clinically. The case was diagnosed as abfraction lesions.

The patient was referred for an x-ray, and treated with composite restorations. Cavities were prepared by rounding the internal angles in order to reduce internal stress and all sharp line angles were smoothed and beveled with a fine bur. Removing these line angles as well as the V-shaped pattern of the cervical lesion should relieve concentrated stress at the apical area of the lesions.

The technique for restorative treatment included placement calcium hydroxide material as a liner in deep cavities (Figure 2) followed by direct placement of either glass ionomer cement especially for premolars or composite restorative (Grandio-VOCO, Universal Nano-Hybrid Composite) materials using a light-curing and excellent polishing (Figure 3& 4).

III. Discussion

Abfraction is defined as a wedge shaped defect at the cervical region of a tooth with different clinical appearances mostly seen as an angular notch like depressions on the facial surface of tooth structure at the junction of tooth and gingiva. This could be due to flexure of the cusp leading to mechanical overloading and might be also accompanied by pathological wear such as regressive alterations of teeth [13]. In the present case, a typical shape of previously described abfraction lesion was detected. The patient history of bruxism confirmed the etiology of the lesion which are the occlusal stresses and para-functional habits. These findings are corroborate by another study in which the clinical relationship between the incidence of occlusal wear and cervical demineralization with NCCL(non-cariou cervical lesion) dimensions has been reported using optical coherence tomography. The authors concluded that the dentin demineralization promotes the formation of NCCLs from an early stage, whereas occlusal stress is an etiological factor that contributes to the progression of these lesions [14].

The treatment strategy of such lesion requires the following steps: identifying an accurate diagnosis (type of cervical lesion: carious, abrasive or abfraction); identification of etiologic factors and remove or control them if possible; treatment of abfraction lesions by restorative treatment [15, 16]. Restoration of loss of dental hard substance which is a result of the phenomenon of abfraction help improve the patient's oral hygiene by eliminating undercuts and hypersensitive areas. The restorative treatment also improves the appearance and increases the strength of coronal structures. The occlusal etiopathogenesis leads to the need for complex dental treatment, which consists of: occlusal adjustments or removing parafunctions. Occlusal adjustment should be undertaken only in cases where the interferences are well established and diagnosed.

In the present case, occlusal adjustment was established by very fine selective grinding to relief the over occlusal stresses in certain areas using an articulating paper to mark the most stressed areas. Also, the patient was advised to wear a prefabricated rubber night guard to relief teeth clenching during night sleeping.

For restoring abfraction lesions, many materials and techniques have been tried with inconsistent results. The current optimal treatment option for dental abfraction lesions is light-cured composite restorations. The results are excellent when the treatment's principles are followed; these principles refers to: aesthetic objectives (color, texture, morphology); tooth preparations, technique and adhesive techniques used; equally important are the selection, insertion and finishing coronal restorative material [17]. In the present case, composite restorative materials using a light-curing and excellent polishability (Grandio-VOCO, Universal Nano-Hybrid Composite. (Figure no 3) was used. (Figure no.4 A and B). The success of restorations of abfraction lesions in this clinical case is due to the appropriate selection of the composite material and the accuracy of the technique used. Nano-Hybrid Composite is a very good material for this type of restorations because of its low shrinkage stress, lower modulus of elasticity, and excellent appearance. The material with a low modulus of elasticity will flex with the tooth [18]. High quality standards for all dental restorations require achieving aesthetics and restore the functions of the teeth.

Although Glass ionomer material has many unique properties like their direct chemical bonding to tooth structure [19], good marginal seal, fluorid release and their anticariogenic property, the main disadvantage has been seen in this case report is their biodegradation and fluid dissolution with subsequent marginal discoloration.

On the other hand, despite of all good physical, mechanical and esthetic properties of composite resin restoration used in restoring the abfraction lesion in the anterior teeth, it was observed a degree of gingival recession after one year follow up. This may be due to irritant contents incorporated in the composite resin composition that when get in direct contact with the gingival tissues has led to some degree of gingival recession.

IV. Figures



Fig (1): Clinical view of abfraction lesions on upper anterior teeth with premolars



Fig (2): calcium hydroxide and RMGIC in deep cavity



Fig (3): After application of composite restoration at two central incisors.



Fig (4) (A): After application of GIC on right maxillary premolars.



Fig (4) (B): After application of GIC on right maxillary premolars.



Fig (5): Final appearance after one week treatment



Fig (6): Gingival recession after 1 year.



Fig (7): Grandio, Universal Nano-Hybrid composite material

V. Conclusion

Teeth abfraction lesions can be treated by various adhesive esthetic restorations such as the light-cured composite materials. However, a successful treatment is complex, depending on many factors including addressing the etiological factors such as occlusal stress in cases of bruxism.

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