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OPEN

ARS Medica Tomitana - 2014; 3(78): 153 - 158
10.2478/arsm-2014-0028

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Dental abfraction- case report

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ABSTRACT
Dental abfraction is a pathological process which causes a loss of dental hard substance. Etiopathogenesis is related to occlusal stress that causes microfractures in enamel and dentin in the cervical region. The restoration treatment is made using aesthetic adhesive materials, but must take into account the causal factors and the specific area where the restoration is done.

Keywords: abfraction lesions; cervical area; oclussal trauma; restorative treatment.

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Introduction

Cervical coronal tooth destruction involves the loss of a quantity of substance in the area located near the gums. Most most commonly they are caused by the evolution of carious processes. Besides these, the loss of dental structure can have a non-carious etiology: the dental wear (abrasive dental injury) or due to the phenomenon of abfraction(1,2). Loss of dental substance other than caries etiology is a process that occurs throughout life. Identifying the causes involved in this process is important in order to predict long-term behavior of coronal tooth and restorative treatments.

Pathological loss of dental hard substance in the cervical area, which are caused by flexural forces, usually from cyclic loading are called abfraction lesions(3,4). 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 flexing teeth and consequently cause the appearance of cracks in the enamel prisms by breaking ties of hydroxyapatite crystals. Subsequently cracks

appear in dentin(5). These cracks have a direction perpendicular to the axis of the tooth and produce, over time, through a cumulative effect, a macroscopic loss of hard tissue which has the specific triangular form of the abfraction lesion.

The etiopathogenesis of abfraction lesions is likely to be occlusal, being proven that bruxism or other parafunctions are associated with the occurrence of this type of cervical lesion(6,7). There are theories that say the etiopathogenesis can be plurifactorial with the occlusal trauma associated with phenomena of abrasion and erosion of dental hard tissues.

Abfraction lesions presenting in different clinical aspects, starting from a minimal loss of dental tissue (a groove in third cervical) to the aspect of extensive lesions with the characteristic of evolution in-depth dental pulp direction.

The shape of the abfraction lesions is specific: triangular, wedge-shaped, with sharp internal and external line angles. It seems that 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). They are located at the cemento-enamel junction, but were reported and subgingival locations of these types of injuries.

Abfraction lesions occur mainly in the anterior region of the dental arches, including the premolars. Dental abfraction may be present at the level of a single tooth, on which it is exerted a occlusal trauma, or in the group of teeth when it comes to a parafunction with extensive effects. The most common sites are the bucal and oral faces of the teeth, because of the direction of the occlusal loading forces. There are no altered tissues inside abfraction lesions like decalcified enamel or altered dentin.

Through their evolution, this type of injury primarily lead to dentin exposure, and the appearance of specific signs of dental hypersensitivity to physical, chemical and thermal (cold, sweet)(10). With the progression of the lesion, it can reach up to open the pulp chamber, followed by inflammation and consequent loss of the tooth vitality.

Restorative treatment is required to prevent dental fractures and pulpal complications. Exceptions are only superficial lesions with depth up to 1 mm, which are monitored.

The treatment of abfraction lesions necessarily identify the primary cause of occurrence of injuries by medical history and a thorough clinical examination, focusing on possibilities of reduction of occlusal stress in the respective teeth. In this way, dental restorations have increased chances of survival in the oral cavity.

Restoration of coronary integrity is achieved using modern aesthetic materials: composites resins, glassionomer cements, compomers, resin-modified glassionomer cements(11,12). Unfortunately, these restotarions represent one of the less durable types of restorations and have a high index of loss of retention, marginal excess, and secondary caries. The explanation is the permanent deformation of tooth structure due to occlusal stress in the restorated area.

Case report:

A male patient, 60 years old, presented to our dental practice for dental treatment. We indentified the presence of multiple cervical abfraction lesions, located on the buccal upper anterior teeth, including the upper premolars(Figure no. 1). The patient had complaint of dental hypersensitivity to physical agents, especially cold sensitivity in that area. The examination revealed that the source of sensitivity was the presence of exposed dentin from abfraction lesions.

Figure no. 1. Clinical view showing multiple abfraction lesions on upper front teeth

The medical history revealed the existence of the phenomenon of bruxism, confirmed by objective clinical examination. The patient presented areas of oclussal wear and enamel fissures which are specific to hyperoccluded teeth. The abrasion phenomenon was extended both in the upper arch teeth where the abfraction lesions were localized, and in the lower arch, clearly confirming the presence of the parafunction(Figure no. 2). The clinical examination revealed class IV restorations at central upper incisors previously made with composite materials, also suggesting the presence of excessive occlusal forces.

Figure no. 2. Abrasion phenomenon in both dental arches, specific to bruxism, which led also to abfraction lesions

The technique used in restorative treatment of these abfraction lesions is the technique of direct placement of composite materials using a light-curing universal microhybrid composite, with a low modulus of elasticity: Filtek Z 250 (3M ESPE). The adhesive used was 3M Single Bond Dental Adhesive. The operative visit began with brushing teeth surfaces in order to remove extrinsic stain, followed by careful choice of shade of the restorations, considering its high yellow saturation in the cervical third.

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 relieved concentrated stress at the apical area of the lesion. The edges are beveled to increase the contact surface, and subsequently adhesion, as well as for aesthetic reasons (Figure no. 3). Proper isolation was put in place and and then the cavities were acid-etched with 3 M Scothbond 35% phosphoric acid for 15 seconds and rinsed thoroughly. When the acid-etching was complete, two layers of bonding agent 3M Single Bond Dental Adhesive were placed, thinned, dried for 2-5 seconds and light-curing for 10 seconds. Then the composites resin was applied in succesive layers inside the cavity and light-cured for 20 seconds.

Figure no. 3. Prepared cavities by rounding the internal angles and beveling the edges for better adhesion of composite resins

Special attention was given in adapting restorative material at the gingival threshold and at the the proximal areas where the cavity limits are not well defined. Proper adaptation of the resin composite at the gingival margin is extremely important because any excess composite at the gingival margin would promote dental plaque retention and gingival inflammation.

Finishing and polishing restorations were acomplished with 3M Soft Lex finishing discs, with progressively finer grits. A special attention was given when polishing the restoration at the gingival level(Figure no. 4 and Figure no. 5).

Figure no. 4. The restorative treatment of abfraction lesions with composite resins

Figure no. 5. The final result of restorative treatment of all existing abfraction lesions

The patient was instructed to wear a night mouth guard in order to control the parafunction which led to the abfraction lesions.

Also, the patient was instructed about proper brushing technique, in order to eliminate horizontal movements and applying excessive force on the toothbrush. The restorations have been observed and followed up during subsequent dental visits at every 6 months. After two years their condition is very good, not only that they are maintained, but no signs of loss of marginal adaptation due to abrasion or tooth brushing (Figure no.6).

Figure no. 6. The aspect of restoration after 2 years

Discussion:

Abfraction lesions are common in today's patient population. Their treatment 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(13, 14).

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 etipatogenesis 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.

For restoring abfraction lesions, many materials and techniques have been tried to date.

Current treatment of dental abfraction lesions consists in light-cured composite restorations. The results are excellent when the treatment's principles are respected; 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(15). The success of restorations of abfraction lesions in this clinical case is owed appropriate selection of the composite material and the accuracy of the technique used for work.

Composite Filtek Z 250 (3M ESPE) is a very good material for this type of restorations because of its low shrinkage stress, lower modulus of elasticity, and excellent polishability. The material which has a low modulus of elasticity will flex with the tooth and not compromise retention of the restoration(16). The composite restorations have not only resisted displacement but also have shown no sign of toothpaste abrasion.

High quality standards for all dental restorations

require achieving aesthetics and restore the functions of the teeth. They also stop the evolution of a pathological process.

The need for restorative treatment in abfraction lesions is dictated by the following : the structural integrity of the tooth is threatened, the exposed dentin is hypersensitive, the defect is esthetically unacceptable to the patient, or pulp exposure is likely to occur. At the same time, the treatment of these lesions need the control of etiopathogenic factor: occlusal trauma. In this clinical case, due to the evidence of the relevance of the abfraction mechanism in the development of lesions, the occlusal guard should proved to be a good treatment strategy. It is one of the factors responsible for long-term success of the restorations.

Conclusions:

Dental abfraction lesions benefits restoration with light-cured composite materials. In this way the missing tooth structure is restored in an aesthetically, conservative and predictable way. However, a successful treatment is complex and addresses both the loss of dental hard substance, and etiologic factors. An appropiate treatment protocol is necessary to assure the success of these cervical adhesive restorations.

References

1. Abrahamsen TC. (2005). The worn dentition–pathognomonic patterns of abrasion and erosion. *Int Dent J*. 55, 268–76.
2. Chan D. C., Browning W.D., Pohjola R., Hackman S.& Myers M.L. (2006). Predictors of non-carious loss of cervical tooth tissues. *Op Dent*.31(1), 84–88.
3. Bartlett D.W. & Shah P. (2006). A critical review of non-carious cervical (wear) lesions and the role of abfraction, erosion, and abrasion. *J Dent Res*. 85(4), 306–12.
4. Fruits T.J., VanBrunt C.L., Khajotia S.S. & Duncanson M.G.Jr.(2002). Effect of cyclical lateral forces on microleakage in cervical resin composite restorations. *Quint Int*. 33, 205–12.
5. Grippo J.O., Simring M. & Schreiner S. (2004) Attrition, abrasion, corrosion and abfraction revisited: A new perspective on tooth surface lesions. *J Am Dent Assoc*. 135, 1109–18.
6. Takehara J., Takano T., Akhter R. & Morita M. (2008). Correlations of noncarious cervical lesions and occlusal factors determined by using pressure-detecting sheet. *J Dent.* 36(10), 774–79. DOI: 10.1016/j.jdent.2008.05.009
7. Tsiggos N., Tortopidis D., Hatzikyriakos A. & Menexes G. (2008). Association between self-reported bruxism activity and occurrence of dental attrition, abfraction, and occlusal pits on natural teeth. *J Prosteth Dent*. 100(1), 41–46. DOI: 10.1016/S0022-3913(08)60135-3.
8. Michael J.A., Townsend G.C., Greenwood L.F. & Kaidonis J.A. (2009) Abfraction: Separating fact from fiction. *Aust Dent J*. 54, 2–8. DOI: 10.1111/j.1834-7819.2008.01080.x.
9. Rees J.S. (2000). A Review of biomechanics of abfraction. *Eur J Prosthodont Restor Dent*. 8,139–44.
10. Palamara J.E.A., Palamara D., Messer H. & Tyas M.J. (2006). Tooth morphology and characteristics of non-carious cervical lesions. *J Dent.* 34(3),185–94.
11. Litonjua L.A., Andreana S., Bush P.J., Tobias T.S. & Cohen R.E. (2003). Noncarious cervical lesions and abfractions: A re-evalution. *J Am Dent Assoc*. 134, 845–50.
12. Peaumans M, De Munck J., Landuyt V., Kanumilli P., Yoshida Y. & Inoue S. (2007) Restoring cervical lesions with flexible composites. *Dent Mater*.23, 749–54.
13. Pereira A.F., Poiate I.A., Poiate E.Jr & Miranda W.G.Jr. (2008). Abfraction lesions reviewed: Current concepts. *RGO (Porto Alegre)*. 56, 321–26.
14. Wood I., Jawad Z., Paisley C. & Brunton P.

(2008). Non-carious cervical tooth surface loss: a literature review. *J Dent.* 36(10), 759–66. DOI: 10.1016/j.jdent.2008.06.004

15. Perez C.R. (2010). Alternative technique for class v resin composite restorations with minimum finishing/ polishing procedures. *Op Dent*. 35(3), 375–79. DOI: 10.2341/09-310-TR.
16. Li Q., Jepsen S., Albers H.K. & Eberhard J. (2006). Flowable materials as an intermediate layer could improve the marginal and internal adaptation of composite restorations in Class-V-cavities. *Dent Mater*. 22, 250–57. DOI: 10.1016/j.jdent.2008.06.004