Abfraction Management

Statement of Purpose/TX significance

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Abfraction formation is presently believed to be caused by lateral forces on teeth placed there by occlusal interferences in lateral excursions[1,2]. In facially abfracted teeth, posterior working side contacts that occur during mandibular excursions repeatedly push the crowns of the involved teeth, into a bending moment that causes the crown to rotate laterally away from the long axis of the tooth and down towards the cementoenamel junction. This rotation of the crown compresses it onto the facial aspect of the cementoenamel junction resulting in microfractures of the enamel and cementum (see figure 1).

Over the long term with the passage of time, this repeated cyclic compression and rotation causes notching in the CEJ. This phenomenon also occurs with non-working side contacts that result in lingual abfractions.

Figure 1

A study by Goel[3] has revealed that the enamel resistance to occlusal loading is well tolerated by the occlusal portion of a posterior tooth, but that the cervical area has very poor resistance to occlusal loading. As a result, the cyclic compression of the bending of the crown onto this area is not tolerated well, leading to these microfractures.

Restoration of an abfraction requires a combination of **Restorative Adhesion Dentistry** with **Occlusal Adjustment Therapy**. The restorative treatment fills in the exposed root structure with bonded composite, while the occlusal adjustment eliminates the applied lateral forces that cause the repeated bending moment to occur. The occlusal adjustment then stops the microfracture formation. Without performing the occlusal adjustment, the bonded restoration will be subject to the same bending moment as the unrestored abfraction, leading to marginal breakdown and restoration dislodgment.

Contributory Factors in TX plan/decision making

It is necessary to assess the lateral occlusal contacts present on the abfracted tooth by visualizing excursive contact with both the *T-Scan*™ II, and double sided Accufilm™ articulating paper (Parkell, Inc. Farmingdale, N.Y.). By recording an *Excursive Scan*, the ***T-Scan* II** can illustrate where the interferences are located, and how long (in time) the involved teeth are maintaining contact.

To record an excursive scan of a mandibular excursion, activate the ***T-Scan* II** recording handle, and then instruct the patient to close completely into the sensor, holding their teeth together for a full second, and then commence an excursive movement. Direct the patient to make an excursion to the side of the abfracted tooth that is in need of restoration.

Playing back the resultant Force Movie will show the operator where, and for how long, the abfracted tooth is not disengaging from its opposing tooth during excursive function.

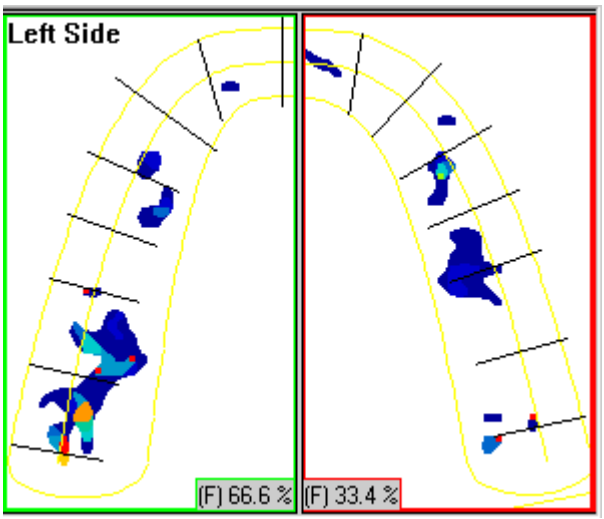

Figure 2 - (2D contour view)
1st Premolar; Light closure forces 2.21 seconds

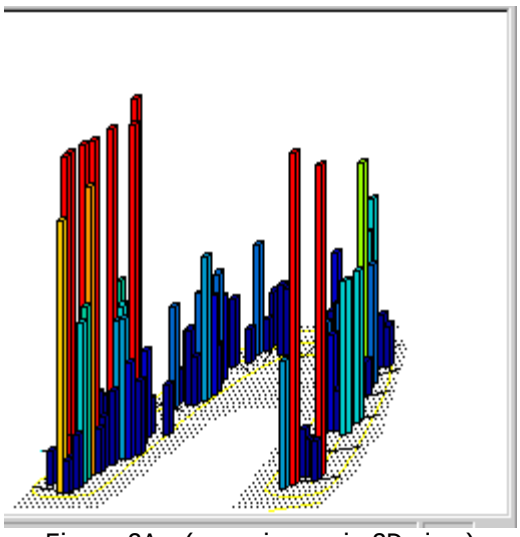

Figure 2A - (same image in 3D view)

Note the duration of time that the abfracted tooth is in contact during excursive function.

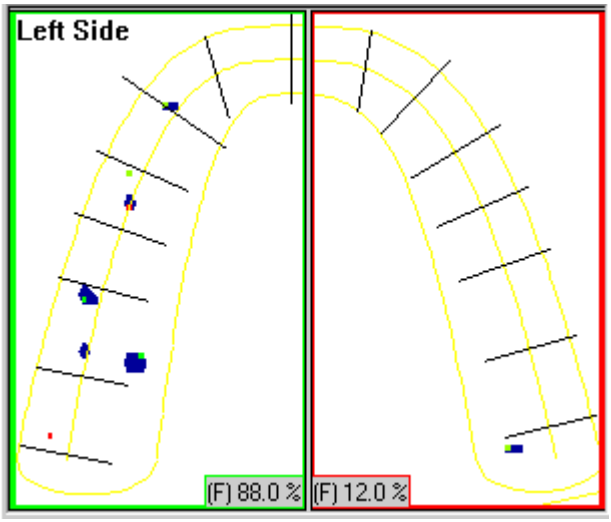

Figure 3 - (2D contour view)
1st Premolar; Interferences in excursion 3.12 seconds

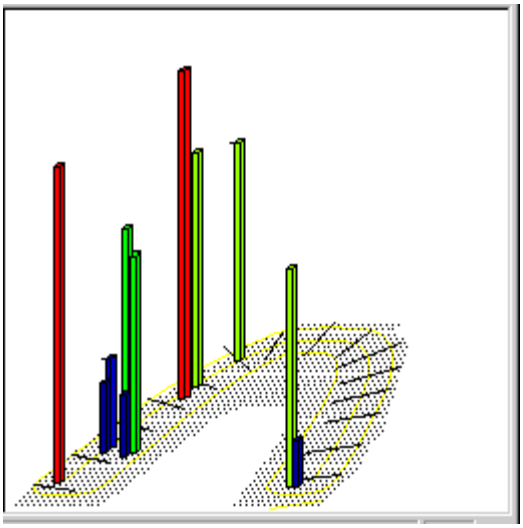

Figure 3A - (same image in 3D view)

This time needs to be drastically shortened to succeeded in arresting the abfractive process. In the above example, the closure contact on the first premolar is light, but as the excursion commences and is prolonged for .91 seconds (the difference between 2.21 and 3.12 seconds), the working side contact increases in force, while the lower premolar moves across the upper premolar. This repeatedly applied force increase pushes the first premolar laterally with each chewing stroke, thereby rotating the crown outwards and towards the cementoenamel junction.

Summary of TX objectives with respect to Occlusal Management

After the restorative procedures are completed by bonding the abfraction closed, the occlusal interferences should be removed. Mark the teeth with the black side of the Accufilm™, by having the patient perform a complete mandibular closure. Then mark the teeth with the red side while the patient makes an excursion over the abfracted tooth (teeth). The red track marks that appear are the result of the prolonged excursive contact that is present during the excursion (see figure 4).

Figure 4

Adjust the involved tooth by completely removing the red track marks, while leaving the full closure contacts black marks present. Re-mark the teeth with red Accufilm™ during another excursion, and remove any resultant track marks that remain. Repeat this process until only the black closure contact marks are present on the involved tooth (see figure 5).

Figure 5

Use the ***T-Scan* II** to verify that the pretreatment prolonged interference contact has truly been removed. Record a new Excursive Scan, and determine the Disclusion Time[4]

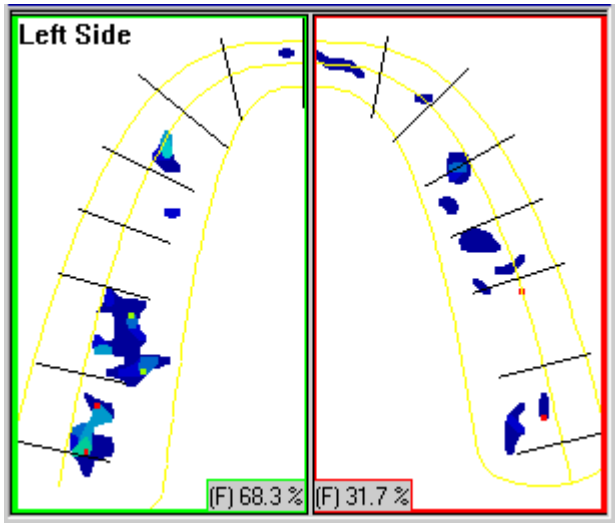

Figure 6 - (2D contour view)
Full Mandibular Closure at .404 sec.

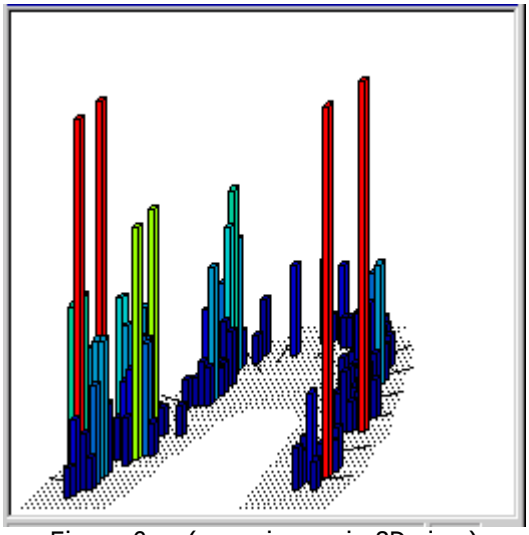

Figure 6a - (same image in 3D view)

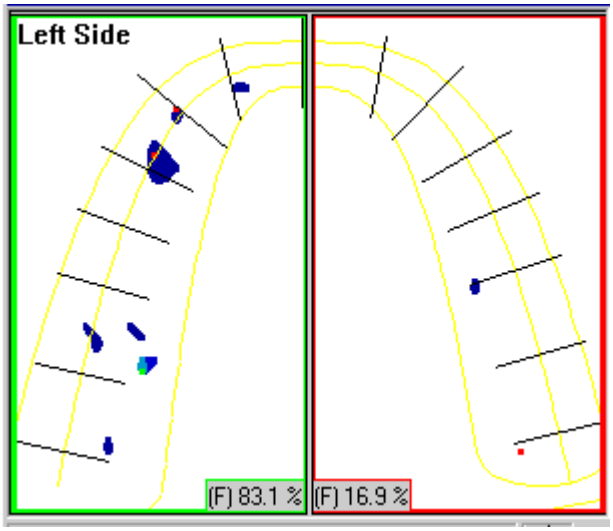

Figure 7 - (2D contour view)
1st Premolar Disclusion at .610 sec.

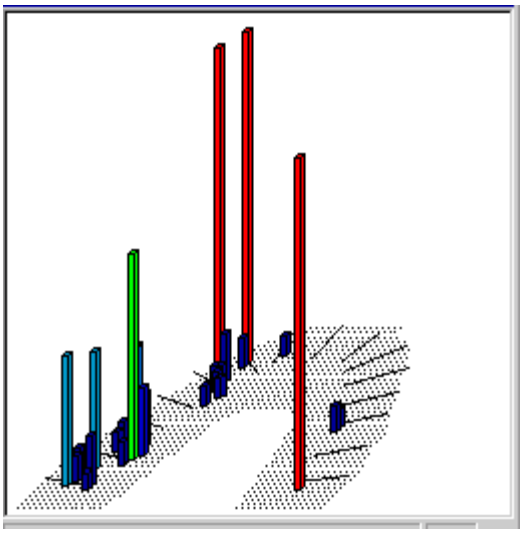

Figure 7A - (same image in 3D view)

Disclusion of the first premolar occurs after occlusal adjustment in .206 seconds (the difference between .404 and .610 seconds) after excursive commencement. This short time will insure that the lateral stresses that were present pretreatment are removed from the excursive function. This will stop the cyclic compressions of the crown onto the cementoenamel junction, which will in turn, arrest the abfractive process.

Summary and Conclusion

In order to successfully treat an abfractive lesion, a combination of Adhesion Restorative Dentistry and Occlusal Adjustment Therapy are needed. It is essential to remove the lateral interferences that create the cyclic compressions of the crown

onto the cementoenamel junction so that the microfractures of the enamel and cementum are eliminated. This is the way to insure that the bonded restorative material stays in place in the lesion, and the abfractive formative process is arrested.

Figure 8

References

1. Grippo, J.O. Abfractions; a new classification of hard tissue lesions of teeth. J Esthet Dent 1991; 3(1):14-19.
2. Callien, G.S., et al. A review of non carious dental cervical lesions. Compendium 1994; 15(11):1366.
3. Goel, V.K., et al. Clinical implications of the response of enamel and dentin to masticatory loads. JPD 1990; 64(4):446-454.
4. Kerstein, R.B., and Wright, N. An electromyographic and computer analysis of patients suffering with chronic myofascial pain dysfunction syndrome; pre and post treatment with immediate complete anterior guidance development. JPD 1991;66(5):677-686.