Abfractions: A New Classification of Hard Tissue Lesions of Teeth

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Due to the stresses resulting from biomechanical loading forces exerted on the teeth (static, as in swallowing and clenching or cyclic, as in chewing), both enamel and dentin can chip or break away. This loss of tooth substance, which shall be termed *Abfraction*, is dependent on the magnitude, duration, direction, frequency, and location of the forces. These abfractive lesions are caused by flexure and ultimate material fatigue of susceptible teeth at locations away from the point of loading. Clinical observation of a variety of enamel and dentin lesions due to the shapes, sizes, loci, and frequency warrants a new and distinct classification.

The loss of tooth substance (both coronal and radicular), other than through accidental fracture, anomalies, or caries, can occur in a variety of ways related to function, wear, and longevity. Many bioengineering forces involving biomechanical, biochemical, and bioelectric principles come into play in this process. Because of the complexity, diverse activities, and consequent effects that take place in the oral environs, it is difficult to have each lesion classed in one category as several factors may sometimes be involved in their development. The composition, arch position, and shape of a tooth are most important considerations; however, the quantity and pH of the saliva, as well as the composition of the diet, affect teeth. The development and activity of the muscles of mastication, coupled with the emotional status of the individual, can also be contributing factors in the degree of tooth material loss.

Most textbooks in oral pathology and occlusion list attrition, abrasion, and erosion as the common forms of tooth substance loss.[1] In light of current and accepted scientific principles, a fourth classification of lesions attributed primarily to biomechanical loading is being presented. This classification is called "abfraction" from the Latin words, ab – "away," plus fractio – "breaking." The new and expanded classification of the lesions are defined as follows:

Attrition — the physiologic wearing away of tooth substance as a result of *tooth-to-tooth* contact, as in mastication. Attrition is most noticeable on occlusal and incisal surfaces. It may also occur at the interproximal contact points as a result of the anterior component of force, where small horizontal and vertical movements of teeth occur during function, thus causing frictional wear.[2] The overall effect of this physiologic wear is a reduction of 0.5 cm in length of the dental arch from the third molars to the midline by the age of 40 years.[3] Attrition involves biomechanical principles.

Abrasion — pathologic wear of tooth substance through (abnormal) *biomechanical frictional* processes. Examples are improper or excessive tooth brushing (mainly affecting root surfaces) and noxious oral habits such as biting a pipe stem, biting fingernails, holding nails between the teeth, and opening bobby pins. Bruxism is the most destructive manifestation of abrasion.

Erosion — chemically induced loss of tooth substance, mainly through *acid dissolution*. Erosive acids may have an extrinsic or intrinsic origin: the former through diet, e.g., citrus fruits or juices, carbonated soft drinks, baby bottle syndrome, or air (in some industrial chemical plants); the latter through regurgitation of gastric acids (habitual vomiting, as in bulimia, pregnancy morning sickness, or hiatal hernia).

Abfraction — pathologic loss of hard tissue tooth substance caused by *biomechanical loading* forces. These lesions are due to flexure and ultimate fatigue of enamel and dentin at a location away from the point of loading.

The effects of these forces, during static or cyclic activity, which are governed by the direction, magnitude, frequency, duration, and location, are ever present and unavoidable whenever teeth come in contact. It is estimated that during normal function, the average length of tooth contact per 24-hour period is 9.0 minutes for chewing and 17.5 minutes for swal-

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