NON-CARIOUS CERVICAL LESIONS : TO IGNORE OR TO RESTORE

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Non-carious cervical lesions characterised by the loss of hard tissue at the cemento-enamel junction in the absence of a caries catch are conditions commonly encountered in dental practice. Little is known about their overall prevalence.

Most case studies suggest that prevalence increases with age but substantial numbers are found in people younger than 35 years.[10,14]

The aging of the population, coupled with prolonged retention of teeth into old age, means that dentist are likely to encounter more patients with non-carious cervical lesion. Non-carious cervical lesion are usually classified by their commonly accepted causes. Three major types are believed to be caused by: (1) abrasion associated with toothbrush. (2) chemical erosion (3) tooth flexure.

The differential diagnosis of a lesion in clinical practice is more problematic because any individual lesion is likely to result from the interaction of one or more etiologic factors. They are usually termed as wasting diseases.

Wasting Diseases is used in a collective sense to designate any kind of slow and gradual loss of tooth substance characterised by a smooth polished surface; without references to the cause of such loss.

Erosion (e+rodere) : to eat away; refers to the superficial chemical disintegration of tooth substance.

Abrasion (ab+rodere) : to rub off, is a slow and gradual wasting away of tissue by friction.

Attrition (atterer) : to rub upon or against, to wear away by rubbing together : designates the particular condition in which abrasion is produced by the rubbing of teeth upon each other in mastication. etc.

Denudation : is used in the ordinary sense of laying bone or divesting of a protecting covering.

The differential diagnosis of a lesion in clinical practice is more problematic because any individual lesion is likely to result from the interaction of one or more etiologic factors. Preventing the development of additional lesion and halting the progression of lesion already present depend on the determination of the etiologic factors acting in each individual patient. Without this knowledge appropriate prophylactic measure cannot be used.

Many questions remain about the action and interaction of abrasion, erosion, attrition and occlusal factors in producing these conditions.

Although the assumption has been that all cervical lesion should be treated in the same way, regardless of their cause recent clinical investigations belie this notion.[7,10,11] The first step in effective treatment is again recognising their cause.

Shafer, Hine, and Levy however asserted that attrition, abrasion and erosion are three separate and distinct processes each of which result in loss of tooth substance. The terms are

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frequently used interchangeably but such careless terminology serves only to confuse the recognition of the etiology and to delay institution of proper treatment. Unfortunately the cause for this consternation prevails to the present day.[18] Dental professionals currently use the term erosion to describe a loss of tooth substance by a chemical process that does not involve known bacterial actions.

The Glossary of Metallurgical terms and tables endorsed by the American Society for metal defines the term erosion: as the abrasive destruction of materials by the movement of liquids or gas; with or without solid particles. Corrosion: as defined by the same text is the physical deterioration of a material by chemical or electrochemical attack which describes more precisely the process dentist identify as dental erosion. Therefore erosion result from mechanical degradation rather than a chemical breakdown. Furthermore engineers use the term stress-corrosion whenever stresses are concentrated in the presence of a corrosive substance.

Perry's Chemical Engineers Handbook describes both metallic and non-metallic corrosion.

Metallic corrosion is defined as the degradation of a metal by chemical or electrochemical attack in a particular environment. The deterioration of plastics and other non-metallics which are susceptible to swelling, crazing, softening and so forth is essentially physiochemical rather than electrochemical in nature. Teeth are non-metallic and crystalline hence fall in this category.

STRESS-CORROSION - ABFRACTION

The physiochemical degradation of tooth substance is a significant event that may occur during interocclusal activity. This most notably involves the cervical region of the teeth and takes place in the presence of acidic substances. This process which is a synergistic interaction of mechanical stress caused by loading forces and chemical corrosive reactions, is properly termed "stress-corrosion" Inaddition to this physiochemical activity, the effect of piezoelectricity may contribute to tooth substance loss. Piezoelectricity refers to the small electric charge that is generated when teeth are mechanically deformed.[4]

The dynamic stresses that occur in the mouth during interocclusal activity such as chewing or bruxing significantly influence the breakdown of tooth structure. Engineering studies have demonstrated that when teeth are loaded in a horizontal direction the effect of stress becomes concentrated in the cervical region, causing flexure.[3,17,21]

The cyclic tension and compression that occur in this area can reach a fatigue limit and result in this cracking or breakage of the tooth structure. These horizontal loading forces cause a microscopic bending of the anatomical crown of the tooth; with resulting tensile stress concentrating in the cervical region on the side of the tooth from which the force is directed. At the same time, the opposite region is under compressive stress. When the direction of the force changes (as in bruxism) the tooth bends in the opposite direction and the stresses correspondingly reverse at this cervical area. This bending of the tooth from side to side results in fatigue and fracture of the most flexed zone, the cervical surface layer, be it enamel, cementum or dentin.[9,16]

Many investigators hypothesize that these interocclusal forces create physical microfractures, or abfractions, at the cervical region, which in turn results in cervical lesions.[1,2,5,6,7,12,15] It seems logical and appropriate to adopt a terminology that would most accurately describe the etiology of such

lesions, namely stress corrosion which also can result in stress-corrossion cracking. Based on this reasoning. Grippo suggested that lesions that result from the micro-cracking of the tooth substance (and the process of physical of physiochemical wasting) be referred to as abfraction meaning breaking away.[6]

Because of the diverse dynamics that take place in the oral cavity, particularly during interocclusal contact, most of the lesions that we see result from a combination of two or more processes. From an engineering perspective, four combined, or synergistic, events may explain the loss of dental hard tissue: 1. erosion-corrosion 2. abrasion-corrosion 3. abrasion-abfraction 4. biocorrosion-abfraction.

EROSION CORROSION

Erosion-corrosion may result from consumption of highly acidic wine, citrus juices or carbonated beverages.[19,20] The wasting of teeth as seen in bulimia, termed perimylolysis is another example of the combined activities of erosion and corrosion occuring during the flow of regurgitated acidic stomach contents over the teeth.[8]

Schachtele has reported that any food substance with a critical pH value of less than 5.5 can demineralise the hard tissue of teeth. People who are exposed to a flow of occupational corrosive chemicals, such as hydrochloric and sulphuric acid fumes, also may experience erosion corrosion.

ABRASION CORROSION

Should a tooth surface be demineralised by some exogenous or endogenous acidic agent, then the frictional effects of the tooth -brush would easily brush the surface away. Such abrasion corrosion could occur if a person were to brush his or her teeth immediately after drinking an acidic beverage such as wine or citrus fruit juice. The resulting tooth substance loss from toothbrush abrasion on the corroded tooth surface should be termed abrasion-corrosion.

ABRASION ABFRACTION

The pathologic loss of tooth substance caused by frictional effects on an area of abfraction (that is a surface that has been weakened by loading forces) can be termed abrasion-abfraction. eg. The effect of tooth brushing on cervical areas that are subject to flexure and where tooth substance weakened physically or physiochemically (by stress corrosion) is abfraction.[2,5]

BIOCORROSION ABFRACTION

The combined effect of biocorrosion (caries) and abfraction is the pathologic loss of tooth substance associated with caries (biocorrosion) where plaque adheres preferentially to the tooth surface roughened by flexure microfracture (abfraction). This would be particularly notable in abfractions that occur in areas difficult to access for effective oral hygiene. One study has suggested that root caries could be potentiaed by the prescence of plaque in areas of stress concentration resulting in stress corrosion.[4]

Furthermore, as the depth of the lesion enlarges through degradation, the degree of stress concentration and thus of bio-corrosion abfraction increases. This may well explain the rapid progression of radicular caries.

Due to the confusion that exists about the application of the terminology it is timely and fundamental that a uniform definition be established among the sciences. This will allow more accurate descriptions of the dynamic events that are now recognised in the mouth.

Such terminology would recognise the critical role of occlusal function and parafunction in

multifactorial etiology of dental hard tissue lesion. Use of a common precise and specific language will improve communication and should simplify and promote research in this area of bioengineering.

This approach will assist in determining the etiology and making a differential diagnosis of these various hard tissues lesions. It will enable the clinician to institute more predictable preventive and therapeutic measures, such as orthodontics, coronoplasty, occlusal adjustment, biteguard appliances and restorative dentistry.

TREATMENT

STRAIN WITHIN TOOTH STRUCTURE (TOOTH FLEXURE)

Teeth are not rigid structures. They undergo deformation (strain) during normal loading. Intra-oral loads (forces) vary widely and have been reported to range from 10 to 431 N (1 N = 0.225 lb of force) with a functional load of 70 N considered clinically normal. Obviously the type of teeth, type of occlusion and occlusal habits of patients, such as bruxism affect the load per tooth.

Tooth flexure has been described as either a lateral bending or an axial bending of a tooth during occlusal loading. This flexure produces the maximal strain in the cervical region, and the strain appears to be resolved in tension or compression within local regions, causing the loss of bonded cl V restorations, in preparations with no retention grooves. More over, one current hypothesis is that tensile or compressive strains gradually produce microfractures (called abfractions) in the thinnest region of enamel at the cemento-enamel junction. Such fractures predispose chemical erosion. This process may be key in the formation of cl V defects.

In unbounded or leaking restorations,this flexure of the dentin may also produce changes in fluid flow and microleakage leading to sensitivity and pulpal inflammation respectively.

These notches are progressive, enlarging with time if the causative factor is not eliminated.

When notches occurs the operator must first decide, with input from the patient, whether or not the area needs to be restored. The decision to restore is based on the following considerations:

CARIES

If caries is present, the defect should be restored unless the lesion is incipient and very superficial. For the incipient root caries lesion treatment may consist only of minor recontouring of the area (cemetopalsty) and application of a topical fluoride. (Most erosion and abrasion notches are not carious).

GINGIVAL HEALTH

If the notched defect is determined to be causing gingival inflammation (ie. plaque retention) and/or further gingival recession is anticipated, the notched defect should be restored.

ESTHETICS

If the notched area is in an esthetically critical position, the patient may elect to have the area restored with tooth coloured restoration.

SENSITIVITY

If the notched area is very sensitive, application of a dentin bonding agent may, at least temporarily reduce or eliminate the sensitivity continuing sensitivity may require restoration of the area.

PROTECTION

If the notched area is very large and deep only the restoration of the defect may be indicated to avoid further defect development that may cause a pulpal exposure.

TOOTH STRENGTH

If the notched area is very large or deep, the strength of the tooth at the cervical area may be compromised. Placement of a bonded restoration will eliminate further progression of the defect and may restore some of the lost strength.

The cavity preparation for a cl V abrasion/erosion area usually requires only roughening of the internal cavity wall, beveling all enamel margins and placing a retention groove is non-enamel area. If necessary, prepare a root surface cavo surface margin to approximately 90 degrees.

Restoration retention and greater resistance to marginal leakage results from groove placement, because this retentive feature assists in resisting the effects of polymerization shrinkage and tooth flexure.

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