I: Introduction and definitions

**Abrasion** - Abrasion is the pathologic wear of tooth structure due to an abnormal mechanical process (dentifrice/toothbrush, etc.).

**Erosion** - Erosion is the chemical loss of tooth structure from chronic exposure to acidic materials.

**Attrition** - Attrition is the wear of tooth structure from tooth-to-tooth contact.

**Abfraction** - Abfraction results in non-carious cervical lesions due to tooth flexure and tooth weakening largely induced by parafunctional contact.

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II: Early theories

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III: Bioengineering factors and causes of NCCLs

A. Tooth flexure and the role of parafunction

- Numerous finite element analysis (FEA) studies reveal tooth flexural stresses are concentrated in the cervical region.

- **Parafunction** (bruxism, clenching, traumatic occlusion) is the primary source of the flexural stresses.
B. Tooth morphology factors

C. Erosion

D. Stress corrosion

E. Abrasion

IV: Epidemiological studies
A: Archaeological specimens
B: Isolated populations with no access to modern oral hygiene tools
SUMMARY:
In a landmark article that appeared in the *Journal of Esthetic Dentistry* in 1991, Dr. John Grippo introduced a term called "abfraction." This term has been used to describe non-carious cervical lesions that result primarily from the destructive effects of tooth flexure associated with stressful occlusion or parafunction (bruxism, clenching, etc.). Dr. Grippo eloquently described the morphology and proposed mechanism of formation of these lesions and later the importance of contributing co-variables, such as stress corrosion (accelerated loss of tooth structure when flexural stresses occur in the presence of an acidic environment). Regrettably, many in dentistry dismissed this notion early on as pure unsubstantiated speculation.

As early as 1984, Lee and Eakle theorized the role of tensile stress in the etiology of non-carious cervical lesions in teeth. Interestingly, controversy has persisted among dentists and academicians regarding the validity of this proposed etiology, in spite of...
mounting evidence that, indeed, tooth flexure plays an important, and probably under-
estimated, role in the etiology of non-carious cervical lesions. The very nature of non-
carious cervical lesions makes them difficult to study, because what causes the lesions to
initially form may or may not be what results in their progression. By the time the lesion is
formed, the "smoking gun" may be long gone.

As most research reveals, the etiology and progression of non-carious cervical lesions
is multi-factorial, including mechanical abrasion and chemical erosion along with the
potentially destructive effects of cervical tooth flexure resulting from stressful occlusion.
Clearly, once lesions initially are formed and dentin is exposed, any one or all factors can
contribute to their progression. Yet, still today, there are those in dentistry who staunchly
maintain that toothbrush abrasion is the cause of most of these lesions, and that tooth
flexure from stressful occlusion plays no role whatsoever in the etiology of these lesions.

If most non-carious cervical lesions are formed by toothbrush abrasion, why is it that
we often encounter isolated lesions on a single tooth with no evidence of a lesion on the
teeth immediately adjacent? If these lesions are caused by toothbrush abrasion, how is it
that non-carious cervical lesions can be found well subgingivally in areas inaccessible to
the toothbrush bristle? Occasionally, cervical lesions in patients with periodontal disease
and bone loss even are revealed only upon surgical reflection of soft tissue. How also does
one explain the results from a study of prehistoric skulls by Dr. Susan McEvoy in which
the same types of non-carious cervical lesions that exist in modern-day man were found in
the prehistoric specimens - well before the advent of the toothbrush as we know it. Even if
one questions the wealth of mounting research, common sense should underscore the
contribution that tooth flexure from stressful occlusion makes to the etiology of non-carious
cervical lesions.

References
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