Tooth Surface Loss: Causes and Effects

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Definition

Tooth wear is often referred to as Tooth Surface Loss (TSL) since the process is almost always multifactorial, making it difficult to identify a single cause. It is a normal physiologic process; however, when TSL jeopardizes tooth survival or is of concern to the patient it is often referred to as pathologic. TSL can occur on any tooth surface exposed to the oral cavity, and appears to be interpreted differently in North America and Europe.[1]

Causes

TSL may be caused by erosion, attrition, abrasion, and possibly abfraction.

Erosion is the progressive loss of hard dental tissues by chemical processes not involving bacterial action. Attrition is the wear of tooth substance or a restoration caused by mastication or contact between occluding or approximal surfaces. Abrasion is wear caused by factors other than tooth contact. Abfraction, which literally means "breaking away," has been proposed as a cause of cervical lesions.

Erosion

Erosion is principally caused by dietary factors, especially the ingestion of acidic beverages such as fruit juices and carbonated drinks, including "diet" and "low calorie" options. Lewis and Smith[2] have highlighted the importance of erosion in TSL. One factor of importance in this process is the emphasis placed on slimness and "healthy" eating in Western societies, because many "healthy" foods are also very acidic and abrasive. Erosion tends to cause saucerized defects where acid is in contact with the teeth, and some patterns of ingestion are especially associated with erosion of the palatal surfaces of the maxillary anterior teeth.[3]

Erosion can also occur as a result of regurgitation of stomach contents, which may be involuntary, as in patients with gastric ulcers and hiatus hernias, or self-induced, as in patients with bulimia. Erosion is also a complication of chronic alcoholism,[4] and its effects may be worsened by the reduction in salivary flow and buffering capacity caused by dehydration and some drugs.

Occupations involving exposure to corrosive substances, such as work in battery factories,[5] and some sports, such as swimming,[6] can result in erosion of the teeth, although the pattern of TSL in these cases is different from that associated with dietary factors or regurgitation, as it is normally the labial surfaces of the anterior teeth that are affected, as opposed to the palatal surfaces.

Attrition

Attrition typically affects the occlusal and incisal surfaces of the teeth, and can be significant in patients with a vegetarian diet. It is also associated with parafunctional activity.[7]

Abrasion

Abrasion is often seen in patients who engage in overvigorous tooth brushing or habitually manipulate foreign bodies in their mouths, such as pipes and hairgrips. As with attrition, the condition is rarely caused by a single factor, with erosion being a common cofactor.[8,9]

Abfraction

This process has been implicated as the cause of cervical TSL, with tooth structure thought to be lost as a result of stress-induced cracks in the enamel and dentin.[10] While some authors have shown evidence supporting this hypothesis, Bartlett and Shah[11] suggested in a recent review paper that the evidence for this condition is not robust. They suggested that cervical lesions are probably caused by a combination of erosion, abrasion, and attrition, and noted that there is strong evidence that erosion and abrasion are important in wedge-shaped lesions.

Systemic Factors

Among the factors implicated in TSL are a number of systemic concerns, including the following:

- Body image. In many societies, slimness is seen as an attractive characteristic associated with success. The consumption of acidic beverages, such as fruit juices and diet versions of carbonated drinks, is often perceived as one method of weight control. Unfortunately, these beverages are also associated with TSL.[12,13]
- Many soft drinks are markedly acidic and have powerful brands that are enthusiastically marketed, implicating their manufacturers in TSL.

- Refrigeration, which offers many health benefits, has extended the availability of fruit juices, many of which are very acidic, throughout the year.
- Healthcare workers have been implicated in TSL through the endorsement of "healthy" foods, many of which are acidic or abrasive.

Prevalence

A number of dental surveys in the United Kingdom have found significant levels of TSL. In 1998, one study reported that 66% of adults had tooth wear into dentin on the anterior teeth, 11% had moderate wear with extensive dentin involvement, and 1% had severe wear.[14]

Perhaps more worrying are the findings of a 2003 child dental health survey,[15] which showed that among 5 year olds, 53% had TSL of the lingual surfaces of primary incisors, with 22% showing dentinal or pulpal involvement. Among 15 year olds, 33% had TSL of the lingual surfaces of the permanent incisors, with 5% showing dentinal or pulpal involvement. The corresponding figures for the molars were 22% and 4%, respectively.

Effects

The effects of TSL are often first noted as an altered appearance of the teeth, showing increased translucency, enamel fractures, and shortening of the clinical crowns. The loss of tooth structure can also cause a change in tooth color. Accompanying these effects may be an increased sensitivity to thermal stimulation, pain, pulpal inflammation, and eventually pulpal exposure, especially in younger patients.

Shortening of the clinical crowns may result in changes to the vertical dimension of occlusion (VDO), with an increased interocclusal space. Tallgren[16] has commented on the changes in adult face height caused by aging, wear, and loss of teeth. It has been shown that in some patients, compensatory growth of the jaws results in the VDO remaining relatively constant or even increasing despite tooth wear. It has been suggested that the effects of TSL will depend on the relative balance between wear and compensatory growth.[17]

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