

A review on indices used for wasting diseases of teeth

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Abstract : Tooth wear (attrition, erosion and abrasion) is perceived internationally as a growing problem in the world. Many studies on tooth wear in humans were based on teeth from archeologically obtained skulls. In recent areas many studies have been done among contemporary adult populations. There are many methods to evaluate tooth wear. Indices gives numerical value to quantify dental diseases and cross comparisons can be made based on disease burden and treatment efficacy

Introduction

Tooth wear is a multifactorial condition, leading to the loss of dental hard tissue, ie, enamel and dentin. Tooth wear can be divided into mechanical wear (attrition and abrasion) and chemical wear(erosion). Wasting disease of tooth is defined as any gradual loss of tooth substance, characterized by the formation of smooth polished surfaces without regard to the possible mechanism of this loss¹.

Just like dental caries and periodontal disease wasting diseases of teeth becomes common problem in dentistry and the reason may be the changes in lifestyle, stress and many other factors.

Wasting diseases of teeth includes attrition, abrasion, abfraction and erosion

(Methods for prevention of tooth wear, such as fluoride, drink and diet modification, increasing salivary flow, treatment of conditions leading to gastric reflux, lifestyle changes and restorative procedures)

Wasting diseases of teeth

Wasting diseases of teeth includes attrition, abrasion, abfraction and erosion

Attrition

Attrition is defined as the physiological wear of enamel, dentin or restorations caused by tooth-to-tooth contact as in mastication

Attrition is more of physiologic rather than pathologic and association with ageing processes

Image 1:



Loss of enamel, dentin, or restoration by tooth-to-tooth contact.

Abrasion

Abrasion is defined as loss of tooth substances caused by processes involving bio mechanical friction and usually occurs in exposed root surfaces of teeth

Abrasion might also be caused by the usage of abrasive dentifrices and provoked brushing and manifested as V-shaped notch near the cervical region of exposed root surfaces as shown in Image 2

Image 2:



Pathological wear of tooth substance through bio-mechanical frictional processes. These lesions are provoked by tooth brushing.

Abfraction

Abfraction is the pathological loss of tooth substance caused by biomechanical loading forces that result in flexure and failure of enamel and dentin at a location away from the loading. The incidence of abfraction increases with age. It is known as non-carious cervical lesion (shown in Image 3)

Image 3:



Erosion

Erosion is loss of tooth substances caused by chemical agents, particularly intrinsic or extrinsic acids, without the involvement of bacteria. Most commonly affected tooth is the lingual surface of maxillary anterior and the surface appears smooth and polished. (Shown in Image 4)

Image 4:



Indices used for assessing wasting diseases of teeth

Dental Indices are the tools used to assess the extent and severity of dental diseases which will be expressed in numerical values to make efficient treatment.

Various indices are available for assessing wasting diseases of teeth

1. Smith and knight index

Smith and Knight introduced the more general concept of measuring tooth wear in 1984, where four visible surfaces (buccal, cervical, lingual, occlusal-incisal) of all teeth present are scored for wear irrespective of the cause and since then more recent indices have been developed or modified from Smith and Knight that do not rely on a prior diagnosis and are more clinically relevant.

TABLE 1-INDICES GIVEN BY SMITH AND KNIGHT

SCORE	SURFACE	CRITERIA
0	B/L/O/L C	No loss of enamel surface characteristics No loss of contour
1	B/L/O/L C	Loss of enamel surface characteristics Minimal loss of contour
2	B/L/O/ L C	Loss of enamel exposing dentin for less than one third of surface Loss of enamel just exposing dentin Defect less than 1mm deep
3	B/L/O/ L C	Loss of enamel exposing dentin for more than one third of surface Loss of enamel and substantial loss of dentine Defect less than 1-2mm deep
4	B/L/O/ L C	Complete enamel loss-pulp exposure-secondary dentin exposure Pulp exposure or exposure of secondary dentine Defect more than 2mm deep-pulp exposure-secondary dentin exposure

2. ECCLES INDEX

Eccles originally classified lesions broadly as early, small and advanced, with no strict criteria definitions, thus allowing wide interpretation. Later, the index was refined and expanded, with greater emphasis on the descriptive criteria. It was presented as a comprehensive

TABLE 2-ECCLES INDEX

Class	Surface	Criteria
Class I		Early stages of erosion, absence of developmental ridges, smooth surfaces of maxillary incisors and canine
Class II	Facial	Dentin involved for less than one third surface: two types Type I(Commonest): ovoid: crescentic in outline, concave in cross differentiate from wedge shaped abrasion lesions Type 2: irregular lesion entirely within crown. Punched out
Class IIIa	Facial	More extensive destruction of dentin, affecting anterior teeth part of the surface, but some are localised and hollowed out
Class IIIb	Lingual or palatal	Dentin eroded for more than one third of the surface area. Gingival white, etched appearance. Incisal edges translucent due to loss of is flat or hollowed out, often extending into secondary dentin
Class IIIc	Incisal or occlusal	Surfaces involved into dentin, appearing flattened or with cupping. Under-mined enamel; restorations are raised above surrounding
Class IIId	All	Severely affected teeth, where both labial and lingual surfaces are may be affected; teeth are shortened

TABLE 3-SIMPLIFIED SCORING CRITERIA FOR TOOTH WEAR INDEX

In this index, Cupping' of molar cusps was given a score of 1. In effect, tooth wear is dichotomised as the presence or absence of dentinal exposure^{2,3}

SCORE	CRITERIA
0	No wear into dentin
1	Dentin just visible (including cupping) or dentin exposure
2	Dentin exposure greater than 1/3 of surface
3	Exposure of pulp or secondary dentin

4. BASIC EROSION WEAR EXAMINATION SCORING

The Basic Erosive Wear Examination was first described by Bartlett et al. in 2008 The partial scoring system is based on the surface area affected. Within a sextant (i.e., teeth in mouth divided into 6 parts), the most severely affected tooth surface is recorded according to the severity of the wear (see Table 1). A cumulative score is then matched to a risk level and guidance for its management by a clinician. The management includes steps which identify and eliminate main aetiological factors, preventative treatment and also any operative and symptomatic intervention required by the patient. The frequency of repeating the index ranges from 6–12 months depending on the risk level of patients⁴.

TABLE 4: BASIC EROSION WEAR EXAMINATION SCORING

SCORE	CRITERIA
0	No erosive tooth wear
1	Initial loss of surface texture
2	Distinct defect, hard tissue loss <50% of the surface area
3	Hard tissue loss ≥50% of the surface area

TABLE 4-EROSION INDEX ACCORDING TO LUSSI⁵

Facial	0	No erosion. Surface with a smooth, silky glazed appearance, possible absence of developmental ridges
	1	Loss of surface enamel. Intact enamel cervical to the erosive lesion; concavity on enamel where breadth clearly exceeds depth, thus distinguishing it from toothbrush abrasion. Undulating borders of the lesion are possible and dentine is not involved
	2	Involvement of dentine for less than half of tooth surface
	3	Involvement of dentine for more than half of tooth surface
Occlusal/lingual	0	No erosion. Surface with a smooth, silky glazed appearance, possible absence of developmental ridges
	1	Slight erosion, rounded cusps, edges of restorations rising above the level of adjacent tooth surface, grooves on occlusal aspects. Loss of surface enamel. Dentine is not involved
	2	Severe erosions, more pronounced signs than in grade 1. Dentine is involved

THE EXACT TOOTH WEAR INDEX

The wear on teeth was graded separately for enamel and dentine using 5- and 6-point scales, respectively as shown in table 5 and 6. Any surface change resulting from wear, irrespective of the aetiology, was scored on the cervical, buccal, occlusal/incisal and palatal/lingual surfaces of the upper first molar to the contra-lateral first molar in both arches. In cases of doubt the lower score was recorded. Scoring of dentine exposure followed the basic protocols described by Smith and Knight [1984a], using the colour of the exposed lesion to represent depth and lateral spread. A separate score was given to the area around the cervical margin and to the buccal/facial surface following the protocols defined by Smith and Knight. In brief, the area around the enamel/cemental junction or the zone just above the gingival margin, if this was not visible, was considered as the cervical area. Any part of the tooth coronal to this area was considered to be on the facial/buccal surface. Each examiner also recorded the age and gender. Restorations covering more than 25% of any tooth surface (cervical, buccal, occlusal/incisal and palatal/lingual surfaces) and missing teeth were recorded separately.

TABLE 5-THE EXACT TOOTH WEAR INDEX EXACT TOOTH WEAR INDEX FOR ENAMEL

SCORE	CRITERIA
0	No tooth wear: no loss of enamel characteristics or change in contour
1	Loss of enamel affecting less than 10% of the scored surface
2	Enamel loss affecting between 10% and one third of the scored surface
3	Enamel loss affecting at least one third but less than two thirds of the scored surface
4	Enamel loss affecting two thirds or more of the scored surface

TABLE 6-EXACT TOOTH WEAR INDEX FOR DENTINE⁶

SCORE	CRITERIA
0	No dentinal tooth wear: no loss of dentine
1	Loss of dentine affecting less than 10% of the scored surface
2	Dentine loss affecting between 10% and one third of the scored surface
3	Dentine loss affecting at least one third but less than two thirds of the scored surface
4	Dentine loss affecting two thirds or more of the scored surface, no pulpal exposure
5	Exposure of secondary dentine formation or pulpal exposure

TABLE 7-BASIC EROSIVE WEAR EXAMINATION INDEX

The most severely affected surface in each sextant is recorded with a four-level score and the cumulative score classified and matched to risk levels which guide the management of the condition. The BEWE allows re-analysis and integration of results from existing studies and, in time, should initiate a consensus within the scientific community and so avoid continued proliferation of indices⁷

SCORE	CRITERIA
0	No Erosive tooth wear
1	Initial loss
2	Dentin exposure greater than 1/3 of surface
3	Exposure of pulp or secondary dentin

CONCLUSION

There are many indices to assess wasting diseases of teeth and most of these indices lacks standardisation. Many of these indices lack uniformity and there is not one ideal index that meets all the ideal requisites of an index and that can be used for epidemiological prevalence studies, clinical staging and monitoring. It is mandatory to do many studies by comparing various indices used for assessing wasting disease of teeth.

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