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Review Article

TOOTH WEAR AND A SYSTEMATIZED APPROACH

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ABSTRACT

Tooth wear is an ever – increasing problem, and younger patients are particularly at risk. The problem is likely to continue as patients demand and expectations rise and as more natural teeth are retained into old age. In this text we aim to discuss the various standard terminologies relating to tooth wear, etiology and systematic management of the same.

Keywords :- Attrition, Abrasion, Erosion.

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INTRODUCTION

Tooth wear is a clinical problem that is becoming increasingly important in aging populations. Attrition the mechanical wear resulting from mastication or parafunction which is limited to contacting surfaces of the teeth is the most visible sign of tooth wear. In addition abrasion i.e. the loss of tooth substance by physical means other than opposing teeth and erosion i.e. the progressive , chemical but nonbacterial loss of tooth substance may contribute to the wearing away of tooth substance. Thus tooth wear is an all embracing term that describes the combined process of attrition, abrasion and erosion.

Non carious loss of tooth structure is a normal physiologic process and is considered excessive or pathologic when compared with the amount of wear for the patients age and where an intervention for cosmetic or functional purposes

Moreover longer tooth retention by the ageing population increases the likelihood that clinicians will be treating patients with worn dentitions. At this point when aetiology of wear and its treatment is of importance, the parameters that determine what constitutes severe wear and when treatment should be carried out remains unclear.

Standard terminologies related to tooth wear

To study the wear processes of teeth a clinician must be aware of terminology for scientific studies of wear in the oral cavity. This is best accepted from the science of wear or tribology which is defined as the science and technology concerned with interacting surfaces in relative motion. Although an international document on the terminology for studying wear processes has not yet been established few definitions from two documents can be quoted. (ASTM G40, standard terminology relating to wear and erosion [ASTM 1988] [1]

Wear – Damage to a solid surface, generally involving progressive loss of material due to relative motion between the surface and the contacting surface Abrasive wear – Wear due to hard particles or hard protuberances forced against and moving along a solid surface Adhesive wear – Wear due to localized bonding between contacting solid surfaces leading to material transfer between the two surfaces or loss from either surface

Corrosive wear – Wear in which a chemical or an electrochemical reaction with the environment is

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Significant.

Erosive wear – Progressive loss of original material from a solid surface due to mechanical interaction between that surface and a fluid, a multicomponent fluid or impinging liquid or solid particles

Fatigue wear – Wear of solid surface caused by fracture arising from material fatigue

Pitting – Wear characterised by presence of surface cavities whose formation is attributed to process such as fatigue, local adhesion or cavitation.

Ploughing – The formation of grooves by plastic deformation of the softer of two surfaces in relative motion

Scratching – The mechanical removal and /or displacement of material from a surface by the action of abrasive particles or protuberances sliding across the surface

Spalling – the separation of microscopic particles from a surface in the form of flakes or chips

Tribochemical wear – The development of reaction products as a result of chemical reactions between the wear couple and the interfacial medium

This list illustrates the complexity of the wear process and in most cases a combination of several types of wear occurs.

The terms used in clinical dentistry are different and the most well known terminology is the one described by pindborg (1970) [2].

Attrition – The gradual loss of hard tooth substances as a result of chewing activity. Various degrees such as physiological intensified and pathological attrition are described

Abrasion – Is tooth wear caused by friction from a foreign body, independent occlusion between the teeth. (Intensified use of toothbrush, tooth pick)

Erosion – The loss of hard tooth substances due to a chemical process not involving bacteria

Perimylolysis – The loss of hard tooth substances due to a combined erosive and mechanical action by the tongue against the palatal surfaces of maxillary teeth in particular. This is seen in patients with bulimia nervosa.

Abfraction – Is cervical V – shaped dental defects, sometimes located subgingivally beyond the influence of "toothbrush abrasion"

This suggests that heavy stressing of the teeth results in flexure of teeth that leads to strain microfractures along the buccal cementoenamel junction making the area more prone to destruction

The clinical term attrition comprises all technical types of wear except adhesive wear.

The term abrasion includes mainly abrasive and corrosive types. The clinical term erosion means approximately the same as the technical term "corrosive wear" whereas perimylolysis may be a combination of corrosive, abrasive wear and tribochemical reactions.

This clinical dental terminology seems to be so well established in dental texts that a total conversion to a

technical nomenclature to describe a wear of a tooth does not seem justified or atleast not yet (Mair 1992) [3]

Etiology

Identifying the cause of tooth wear is important for both the long term prognosis of the dentition and restorative therapy

In many instances the exact etiology of tooth wear is unknown, and is generally considered to be multifactorial. Ekfeldt (1989)[4] defined some contributing factors: the number of teeth, sex, brxism, age, snuffing, and the buffer capacity of saliva. He found that these explained 41% of the total amount of wear which means that majority of wear was still unexplained. Many more factors are known to contribute to tooth wear in modern man some of these are discussed below Age:

It is generally accepted that the prevalence of tooth wear increases with age. Some loss of tooth structure is normal during a patient's life time as a result of wear and tear. The loss is considered to be "pathologic" only when the degree exceeds what would be considered to be normal for a particular age [5]. The tooth wear index attempted to achieve relevance by proposing maximum acceptable tooth tissue loss for each decade of life. Using this index it was found that between 4.5% and 5.7% of examined surfaces exhibited tooth wear [6]

Gender:

Generally it is been found that the prevalence and severity of tooth wear is more in men than in women. Atleast part of the explanation is that a man has a more powerful build than does a women but few authors found no such correlation.

Occlusal factors:

There is little evidence to support the widely held view that a reduction in the number of teeth causes increased tooth wear however it is accepted that the structure of tooth substance has a profound effect on degree of tooth wear. Aberrant Facial-morphology factor such as that an individual with more horizontal mandible and lesser jaw angle showed extensive tooth wear compared to general population population.(Krogstad and Dahl 1985) [7]

Jaw function:

Reference has often been made to the correlation between bruxism and toothwear. The magnitude of occlusal force in bruxism is may be between 30% and 60% of normal maximum bite force (75 Kg). It is prudent to expect that severity of tooth wear to be more extensive in bruxism patients than the normal individual and also it is been found that normal vertical loss of enamel has been estimated to be about 65μ m/ year but 3-4 times as much in bruxers (Xhonga 1977)[[8] Mentally retarded people often demonstrate excessive tooth wear which has been ascribed to bruxism. (Oilo et al 1987) [9]

Time factor:

The total time of contact between occluding tooth surfaces is probably the most important factor for the development of wear of the incisal /occlusal surfaces of the teeth. Graf (1969) [10] has estimated 17.5 minutes /day as the average time necessary for tooth contact during normal functions such as chewing and swallowing.

Bite force:

The greater bite force usually observed in men has been suggested as an one possible reason for the greater wear in men than in women and however it is generally believed that the time factor play major role when compared to bite force as a contributor of accelerated wear. (Dahl et al., 1993) [11]

Gastrointestinal disturbances:

The clinical picture of perimylolysis is thought to be caused by reflux of gastric juices combined with hyperactivity of the tongue. This seems to be common feature in cases of hiatus hernia and in gastritis due to gastric ulcers [12]. Forced vomiting as in anorexia and bulimia is another example of gastric juice coming into contact with the oral cavity. Chronic gastritis in chronic alcoholic individuals has been found to be associated with repeated subclinical regurgitation.

Dietary factors:

Excessive intake of citrus fruits and beverages with low pH such as cola drinks has been described as causing a substantial loss of hard tooth substances. The consumption of acidic beverages following exercise may be particularly dangerous because of dehydration and lack of salivary buffering [13]. More recently the soft drinks have been promoted as healthy and linked to highprofile sports figures and marketing of soft drinks is often directed to the young adults by associating the beverages with peer group acceptability.

The use of snuff and chewing tobacco has also been related to increased tooth wear (Ekfeldt 1989) [4] though this has been questioned by others. (Magnusson 1991) [14]

Environmental factors:

Studies of environmental effects on the severity of tooth wear have demonstrated that a dusty environment adds to the wear of teeth for instances in iron worker employees, miners and quarrymen (Enborn et al 1986) [15]. Those exposed to acid vapours often present with erosive lesions of their teeth (Skogedahl et al 1977). [16]

Salivary factors:

One of the major roles of saliva is to dilute and buffer acid that enters the mouth. Saliva also acts as a lubricant during mastication. If the salivary flow is reduced the potential for erosive, attritional and abrasive damages increases [17]. As medical science advances and life expectancy grows the use of drugs within the population is more widespread. Many of these drugs cause dry mouth and the associated tooth wear problems are likely to become more prevalent. The problems may be compounded if patients consume acidic drinks in an attempt to alleviate the symptoms and stimulate salivary flow.

Restorative materials:

Dentists often use esthetic restorations, irrespective of whether the restoration is visible. Many of these materials have the potential to accelerate tooth wear particularly if used on occluding surfaces in parafunctional patients [18]. For this reason metal occlusal surfaces are the first choice in patients with extreme tooth wear particularly where an attritional etiology is suspected

Other factors:

An association has been found between an increased degree of tooth wear and both a reduced occlusal tactile sensitivity and a longer occlusal endurance time (Johansson 1992) [19] whether these findings are a cause or an effect is not known. It should be stressed however that in most cases of advanced tooth wear there is a number of causative factors involved. These produce wear of several types, resulting in the various clinical pictures, which the clinicians have named as either attrition, abrasion, erosion or perimylolysis, but which are often combination of these phenomena.

Management Strategies:

Case history:

A thorough case history of a patient should include general health, oral parafunctions, nutritional habits, environmental habits and the development of wear over time. This will help to identify causative factors before prosthetic rehabilitation. A thorough survey of the oral status of the patient contains a clinical examination, including oral examinations like saliva.

Treatment planning:

With information obtained from case history and examination the clinician can plan treatment accordingly Prevention:

The wear of teeth is usually a slow process and therefore does not necessarily lead to a decreased vertical dimension since compensatory mechanism maintains an adequate facial height. For the same reason the dentist should wait before beginning irreversible prosthodontic treatment. At an early stage it is sufficient to advise the patient about precautions regarding diet and importance of breaking parafunctional habits.

But if the patient presents with an active erosive condition, reconstruction procedures, in conjunction with treating the causal element should be initiated without delay.

In this same phase of prevention change in contributing factors can be brought about which will prevent excessive wear, as a reduced number of teeth is correlated to an increased degree of tooth wear , it is important to maintain good oral health and preserve maximum number of teeth. As far as diet is concerned nutritional conditions suspecting of contributing to tooth wear should be altered. Regarding illness patients with anorexia and /or bulimia should be diagnosed and given medical care. For patients with gastrointestinal disturbances and xerostomia the dentist should collaborate with the patient's physician

To reduce the corrosive effect maxillary occlusal splint to protect the palatal surfaces against tongue parafunctions should be recommended. Parafunctions activities may be reduced to some extent by counselling muscle exercises. But in case of nocturnal bruxism which takes place unconsciously wear of an occlusal splint is advised. Several removable devices made of hard acrylic resin known as occlusal splints for one of the jaws is most reliable amongst these devices. In case of extreme bruxers splints for both jaws are necessary and even metal splints may be required.

Restorative treatment:

When esthetics or function are substantially compromised prosthodontic therapy is indicated

This can be either

- Semi irreversible
- Irreversible

Semi – irreversible includes composite resins, partial removable dentures and over dentures. Irreversible treatment include various fixed restorations, such as full crowns, partial crowns, onlays, porcelain laminates etc. Need for treatment:

Before any treatment is started the possible causative factors should be controlled.

A patient may require treatment

- For cosmetic reasons
- For functional reasons
- Because of increased hypersensitivity of teeth

During treatment patients' age, the degree of wear and the need for treatment should be always considered. A condition that may require immediate irreversible treatment in a young individual may not require any treatment at all in an elderly person.

Once the treatment type is decided what needs attention is the vertical dimension of occlusion. But there appears to be a potential for continuous occlusal migration of teeth and alveolar processes maintaining the vertical dimension of occlusion of the face even in extreme wear thus the increase done in vertical dimension during treatment is not done to reestablishment the original vertical dimension of occlusion but to obtain adequate space for the thickness of the restorations provided. Warning against alterations in the occlusal vertical dimensions of the face have been made but clinical experience demonstrates that increases in the occlusal vertical dimension necessary accommodate material thickness of 1.5-2mm in either jaw are well tolerated. According to Rivera-Morales and Mohl (1991) [20] a dentate in the vertical dimension of occlusion is considerable and the dentist should not fear that moderate changes in the occlusal vertical dimension should cause muscle dysfunction provided the occlusion is correctly managed

Space for restorative material can be obtained by

• When all or most teeth in the mouth need restoration , space is obtained by increasing the vertical dimension of occlusion necessary to accommodate the restorative material

• By orthodontically induced intrusion and eruption to obtain space to restore the teeth most heavily worn

• By making use of the difference between the retruded contact position (RCP) and the intercuspal position (ICP)

In case the first alternative is chose, the question about which teeth should be restored first the maxillary or mandibular one remains. It is recommended that the mandibular teeth should be treated to harmonise with the mandibular restorations. In cases where only of anterior teeth show wear and the remaining ones are almost intact, as in perimyloysis space to restore only those teeth necessary may be obtained by means of a partial cobaltchromium splint (Dahl appliance) placed on the palatal surfaces of the maxillary incisors and canines and retained by clasps. This splint has to be worn day and night and removed only for purpose of hygiene.

An increase in the horizontal distance between the RCP and ICP results from a flattening of the posterior cusps, leading to a more anteriorly adopted intercuspal position. This difference between the RCP and ICP may be exploited when space is needed to restore only the heavily worn anterior teeth. The intermaxillary relations must be recorded with the mandible in the retruded position using whichever technique is preferred.

Type of treatment:

It is impossible to give general recommendations about which type of treatment to choose in any single case. In young individuals with wear of the palatal surfaces of the maxillary teeth due to erosive factors and in older people displaying mainly anterior mandibular wear, composite resins may be considered if there is economic limitation for use of crowns with composites but the drawbacks are that shows poor resistance to contact wear and their retention may also present problem.

Removable partial denture and over dentures are comparatively economical and easy to produce compared to fixed restorations. Short clinical crowns in heavily worn dentitions may present problems for clasp retention.

Clinical experience has shown that telescopic crowns for the retention of superstructures have no advantage in heavily dentitions.

The type of treatment most often used is therefore some type of a fixed restorations either based on cast metal and retained by conventional luting cements or based on ceramics and resin bonding procedures.

Choice of restoration:

The choice of restoration depends on the degree of tooth wear, as well as on the factors contributing to the state of the wear. In anorexics/bulimics where the loss of hard tooth substance is mainly limited to the palatal surface of the maxillary incisors and a rim of enamel is still left gingivally palatal incisal porcelain laminates should be chosen. The choice of type of complete crown also depends on the contributory factors and degree of wear if the wear is mainly corrosive and limited to the anterior teeth, all ceramic crowns may be chosen. If it is mainly due to bruxism, ceramo- metal crowns should be used. Otherwise gold restorations should probably be chosen to avoid fractures of the ceramic material. It is important to remember to do no more than absolutely necessary, but never to neglect to do the absolute necessities.

CONCLUSION

The wear of the teeth is a complex process. The real aetiology is largely unknown but a number of contributing factors can be listed.

The management of tooth wear is a major challenge to the dental profession and is likely to continue as changing lifestyles highlight particular etiologic factors. It is important that these causes be identified and if possible eliminated before restorative therapy is initiated. Failure to eliminate the cause may comprise the long term survival of restorations and further deterioration of the dentition.

REFERENCES

- 1. ASTM G 40, Standard terminology relating to wear and erosion, In 1988 Annual book of ASTM standards. Philadelphia, American society for Testing and Materials. pp181-6.
- 2. Pindborg JJ. (1970) (Pathology of dental hard tissue. Copenhagen, Murksgaard, pp294-325.
- 3. Mair H. (1992) Wear in dentistry current terminology. J Dent 20,140-144.
- 4. Ekfeldt A. (1989) Incisal and occlusal tooth wear and wear of some prosthodontic materials. Swed Dent J 65,314-318.
- 5. Smith BGN, Knight JK. (1984) An index for measuring the wear of teeth. Br Dent J 156,435-438.
- 6. Dahl BL, Andersen A. (1989) The suitability of new index for the evaluation of dental wear. *Acta Odontol Scand* 47,205-210.
- 7. Krogstad O and Dahl BL. (1985) Dentofacial morphology in patients with advanced attrition. Eur J Orthodont 7,57-62.
- 8. Xhonga FA. (1977) Bruxism and its effect on the teeth. J Oral Rehabil 4,65-76.
- 9. Oilo G, Dahl BL, Hate G. (1987) An index for evaluating wear of teeth. Acta Odontol Scand 45,361-365.
- 10. Graf H. (1969) Bruxism . Dent Clin N Amer 13,659-665.
- 11. Dahl BL, Carlsson GE, Ekfeldt A. (1993) Occlusal wear of teeth and restorative materials. A review of classification, aetiology, mechanism of wear and some aspects of restorative procedures. *Acta Odontol Scand* 51,299-311.
- 12. Eccles JD. (1979) Dental erosion of non- industrial origin. J Prosthet Dent 42,649-653.
- 13. Eccles JD. (1982) Erosion affecting palatal surfaces of upper anterior teeth in young people. Br Dent J 152,375-378.
- 14. Magnusson T. (1991) Is snuff a potential risk factor in occlusal wear? Swed Dent J 15,25-32.
- 15. Enborn L, Magnusson T, Wall G. (1986) Occlusal wear in miners. Swed Dent 10,165-170.
- 16. Skogedahl O. (1977) Pilot study on dental erosion in a Norwegian electrolytic zinc factory. *Community Dent Oral Epidemic* 5,248-251.
- 17. Bloem TJ. Mc Dowell GC, Lang BR. In vitro wear. (1988) Part II. Wear and abrasion of composite materials. J Prosthet Dent 60,242-249.
- 18. Ratledge DK, Smith BGN, Wilson RE.(1994) The effect of restorative materials on the wear of human enamel. *J prosthet Dent* 72,194-203.
- 19. Johansson A. (1992) A cross sectional study of occlusal tooth wear. Swed Dent J 86,413-418.
- 20. Rivera- Morales WC and Mohl ND. (1991) Relationship of occlusal vertical dimension to the height of the asticatory system. *J prosthet Dent*, 65, 547-553.

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