

REVIEW ARTICLE

Tooth Wear and Its Management - An Overview

Rajneesh Kumar

ABSTRACT

The prevalence and severity of tooth wear (TW) are increasing worldwide. Yet, there is no high-level evidence to support or refute any therapeutic intervention. In the absence of such evidence, many currently prevailing management strategies for TW may be failing in their duty of care to first and foremost improve the oral health of patients with this disease. This overview promotes sound approaches to the management of TW on the basis of the current best evidence of the etiology and clinical features of this disease.

Keywords: Tooth surface loss, Tooth wear, Parafunction, Attrition, Abrasion, Erosion, Abfraction.

How to cite this article: Kumar R. Tooth Wear and Its Management -An Overview. *Int J Med Oral Res* 2018;3(2):21-24.

Source of support: Nil

Conflicts of interest: None

INTRODUCTION

Tooth wear (TW), also known as tooth surface loss (TSL), is an insidious and cumulative multifactorial process involving the destruction of enamel and dentine which can threaten tooth survival and the oral health-related quality of life of affected individuals.^[1,2] Despite the overall trends toward improved oral health and reduced dental caries incidence over the past decades, epidemiological evidence supports the contention that TW is increasing in severity and prevalence, not only among older people who are living longer and retaining more teeth but also among those in the early decades of their adult life.^[3,4] Physiological wear causing vertical loss of enamel in a normal individual is approximately 0.02–0.04 mm a year and wear is considered excessive when it causes esthetic concerns to the patient and causes symptoms of discomfort. Once the amount of TW becomes so severe that recurrent symptoms are caused, then it is deemed “pathological” TSL and becomes a challenge for a restorative dentist. The challenges faced during the clinical management of patients

with TW has raised considerable professional interest as its impact could be severe and may also impact an individual’s quality of life.^[5] The proportion of adults with severe TW generally rises from approximately 3% in young people in their early 20s and to 17% in those over the age of 70.^[6] A large survey of middle-aged adults showed that increasing TW was observed with age particularly at the occlusal and incisal surfaces of teeth.^[7] Epidemiological studies of young adults reported that prevalence of TW ranged from 6% to 45%.^[8,9] In older individuals, the severity of TW has been shown to be consistent.^[10,11]

CLASSIFICATION OF TSL

TSL usually occurs due to three processes, namely abrasion, attrition, and erosion. Abfraction is another process which may potentiate wear by abrasion or erosion.^[12] Experimental and clinical observations have demonstrated that individual wear mechanisms do not act alone but instead, cause loss of tooth surfaces by interacting with each other.

Abrasion

The term abrasion is derived from the Latin verb *abradere* (to scrape o).^[13] It describes the pathological wearing of involving the dental hard tissue through mechanical processes involving foreign objects. The foreign objects are said to be repeatedly introduced in the mouth and cause the condition. Depending on the etiology, the patterns may vary from localized to do use.^[14]

Abfraction

The term abfraction, derived from the Latin verb *frangere* (to break), describes a wedge-shaped defect at the cemento-enamel junction of a tooth.^[15] Lesions due to abfraction are also termed as “cervical stress lesions” in literature.

Attrition

Attrition is the condition resulting mainly from tooth to tooth contact without any foreign substance intervention. It may also describe as physiological wearing and is derived from the Latin verb “*atterere*,” which is defined as the action of rubbing against something.^[16]

Ex Assistant Professor

Department of Prosthodontics, Government Dental College and Hospital, Aurangabad, Maharashtra, India

Corresponding Author: Rajneesh Kumar, Department of Prosthodontics, Government Dental College and Hospital, Aurangabad, Maharashtra, India. e-mail: drknaharwal@gmail.com

Erosion

Loss of dental hard tissues by non-bacteriogenic acid is termed erosion. It is derived from the Latin verb eroder (to corrode). Erosion, however, also causes dissolution of minerals underneath the tooth surface along with the removal and softening of the surface. Evidence also suggests that the condition is becoming more prevalent and has significant effects over the long-term health of the dentition. Nevertheless, damage caused to the permanent teeth due to erosion that occurs during the childhood may compromise the growing dentition for their entire lifespan and, thus, may require increasingly complex restorations which may have to be repeated also.^[17]

ETIOLOGY OF TW

The distinct definition for each class of TW reinforces the traditional point of view that these processes occur independently and may occur in concomitance of other processes as well. Hence, it may be that combining the etiologies probably reflects the true clinical scenarios.^[16]

Abrasion

Both patient and material related factors influences the prevalence of this condition. The brushing technique, brushing frequency, and the force applied while brushing are common patient-related factors. The type of bristle material of toothbrush, stiffness of toothbrush bristles, the abrasiveness, and pH of dentifrice used are factors related to the material.^[17] The most commonly cited effect of abrasion is the V-shaped defect, which usually is ascribed to the use of an intensive horizontal brushing technique. Cervical areas are susceptible to toothbrush abrasion, particularly cuspids and first premolars, where thin buccal plates, gingival recession, and exposed root surfaces predispose cervical notching. Habits involving other intraoral objects (e.g., pipe smoking, toothpick use, and thread biting) can cause defects on the incisal and occlusal surfaces.^[18,19]

Abfraction

These lesions are usually located subgingivally, where in the influence of tooth brushing, abrasion is unusual, and hence are hypothesized to be the result of eccentrically applied occlusal stresses leading to tooth flexure, rather than to be the result of abrasion alone. Weakening of the hydroxyapatite present near the cervical region of the teeth is weakened due to tensile stresses, which produces the classical wedge-shaped defects having sharp edges near to the cemento-enamel junction.^[20,21]

Attrition

Attrition mainly results from contact between opposing teeth and well-defined wear facets are shown in the condition.^[22] The causal factors for attrition are para-functional habits, bruxism, clenching,^[23] developmental defects,^[24] coarse diet, and natural teeth opposing porcelain. It is caused not only by diet or the habits, but a Class III incisal relationship and lack of posterior support also lead to attrition.^[25] Attrition occurs almost entirely on occlusal and incisal surfaces, although it may also effect the buccal and palatal sides of the maxillary and mandibular anterior teeth in deep vertical overlap occlusal relationships.^[26]

Erosion

Dental erosion results when there is a chronic and painless loss of dental hard tissue. The surfaces are usually etched from the teeth surfaces due to the effect of acid and/or chelation with no involvement of bacteria. Evidence also suggests that that erosive wear also predisposes to attrition and that the two mechanisms very often act together causing TSL.^[27,28] Erosion caused due to the industrial acids has shown to be associated with severe attrition of teeth.

TW AND ITS MANAGEMENT

Initial management of TSL depends on accurate diagnosis of the condition, the identification of the etiology and frequent monitoring of the successive changes; hence to prevent further damage. Treatment planning is sometimes very challenging, and it is very necessary that accurate analysis of the TSL is made at an early stage and that satisfactory preventive measures are carried out. Once the risk factors are properly understood, these measures can be accurately initiated. The interrelationship of the four modes of TSL and individual susceptibility influences the degree of TW [Table 1]. Recognition of the multifactorial nature of the condition is the first step in its management, as a failure to appreciate this may lead to inappropriate management and ultimate failure of restorative therapy. Holbrook and Arnadottir^[29] stated that if non-carious destruction of teeth is to be avoided, the following must be considered:

- Recognizing and understanding that the condition exists
- Grading the severity of the condition
- Likely causes are diagnosed appropriately
- Monitoring the preventative measures and the disease progress.

Table 1: TW index by Smith and Knight^[16]

Grade	Criteria
0	No loss of enamel surface characteristics
1	Loss of enamel surface characteristics
2	Buccal, lingual, and occlusal loss of enamel, exposing dentine for less than one-third of the surface incisal loss of enamel minimal dentine exposure
3	Buccal, lingual, and occlusal loss of enamel, exposing dentine for more than one-third of the surface incisal loss of enamel-substantial loss of dentine
4	Buccal, lingual, and occlusal complete loss of enamel, pulp exposure, or exposure of secondary dentine Incisal pulp exposure or exposure of secondary dentine

TW: Tooth wear

TREATMENT RECOMMENDATIONS

Management for the TSL follows the same protocol as it is for any other restorative procedure.

MANAGEMENT OF ACUTE CONDITIONS

This usually involves adjustments of the incisal edge and sharp cusps of teeth and also the application of a desensitizing agent or glass ionomer cement over those areas where dentine is exposed. Pulp extirpation may also be required, and in cases of TW which are severe, a dental extraction may be advised. In those cases, where esthetics has been severely compromised, composite restorations and porcelain veneers may be provided to the patients. When underlying parafunctional tooth grinding habits exist, acute symptoms of temporomandibular joint pain may be present which will require instant consideration.^[30]

PREVENTION

The early management of patients with TW should always be preventive, a emptying to halt the disease process, and avoid any worsening. In patients who have habits of smoking and alcohol consumption, counseling should be done, and their dietary habits should also be documented. A thorough dietary inquiry is often needed if it is alleged that an abnormal dietary or an eating disorder is present. It is often beneficial that such patients reduce the daily intake of fruits, fruit juices, carbonated drinks, or any other acidic substrates. It should also be recommended to such patients that they limit the consumption of erosive foods/beverages during their meals.^[31] Once acid beverages have been taken, it is advised that hard cheese or dairy products are consumed as this is helpful in promoting the rehardening of enamel.^[32] Chewing gum containing carbamide may help in the reduction of erosive agents as they cause a rapid rise in salivary pH. Habitual changes, that is, drinking of the acidic beverages using a straw

and prevention of swishing beverages in the mouth, will reduce the rate of erosive TW. Avoiding overzealous tooth brushing habits and the use of less abrasive toothpaste will also be beneficial. Fluoride reduces the erosive characteristics of soft drinks, while topical applications serve protection against TW after their intake. Patients complaining of hypersensitivity from erosive lesions may benefit from the application of a highly concentrated fluoride varnish in the dental surgery,^[33] while daily use of a potassium-containing sensitive toothpaste may also bring relief. When dentinal hypersensitivity is a worry for individuals, the application of 0.7% fluoride solution may be applied professionally, followed by the home application of 0.4% stannous fluoride by the patient. This regime has shown to be clinically beneficial.^[34] Those toothpaste which contains potassium is also considered to be suitable for dentinal sensitivity management.

MONITORING AND MAINTENANCE

Prevention of pathological wear and undertaking measures so that the rates of wear return to physiological wear must be the primary management goal. However, many patients may find lifestyle changes difficult to implement, and therefore long-term monitoring of all TW patients is required. Monitoring the rates of progression of TW is sometimes very challenging.^[35,36]

It is suggested that monitoring is carried out while taking the following measures:

- High-quality clinical photographs of the patients
- Periodic study casts at the intervals of 6–12 months approximately
- A sectional silicone index produced from the preliminary study cast should be used as a reference guide.

CONCLUSION

The prevalence of TSL is increasing. Early detection of TW is of utmost importance for the prevention of serious irreversible damages to an individual's dentition. It is very important that the multifactorial nature of TW and the risk factors of attrition, erosion, abrasion, and abfraction are understood. This will help us to plan the protocol of diagnosis, the strategy of the management, and a successful treatment outcome.

REFERENCES

1. Al-Omiri MK, Lamey PJ, Clifford T. Impact of tooth wear on daily living. *Int J Prosthodont* 2006;19:601-5.
2. Bomfim DI. Quality of Life of Patients with Different Levels of Tooth Wear, M.Sc. Thesis. London, UK: Department of Prosthodontics, Eastman Dental Institute at the University of London; 2010.
3. The UK Information Centre for Health and Social Care, Adult

- Dental Health Survey 2009: Summary Report and thematic Series; 2011. Available from: <http://www.ic.nhs.uk/pubs/dentalsurvey-fullreport09>. [Last accessed on 2018 Mar 24].
4. Van't Spijker A, Rodriguez JM, Kreulen CM, Bronkhorst EM, Bartlett DW, Creugers NH, *et al*. Prevalence of tooth wear in adults. *Int J Prosthodont* 2009;22:35-42.
 5. Bartlett DW. The role of erosion in tooth wear: Aetiology, prevention and management. *Int Dent J* 2005;55:277-84.
 6. Lee WC, Eakle WS. Possible role of tensile stress in the etiology of cervical erosive lesions of teeth. *J Prosthet Dent* 1984;52:374-80.
 7. Addy M, Shellis RP. Interaction between attrition, abrasion and erosion in tooth wear. *Monogr Oral Sci* 2006;20:17-31.
 8. Lussi A, editor. A multifactorial condition of growing concern and increasing knowledge. In: *Dental Erosion: From Diagnosis to Therapy*. Basel, Switzerland: Karger; 2006. p. 1-8.
 9. Bartlett D. A new look at erosive tooth wear in elderly people. *J Am Dent Assoc* 2007;138 Suppl:21S-5.
 10. Robb ND, Smith BG, Geidrys-Leeper E. The distribution of erosion in the dentitions of patients with eating disorders. *Br Dent J* 1995;178:171-5.
 11. Bartlett D. Intrinsic causes of erosion. *Monogr Oral Sci* 2006;20:119-39.
 12. Hellström I. Oral complications in anorexia nervosa. *Scand J Dent Res* 1977;85:71-86.
 13. Hawkins N, Richards PS, Granley HM, Stein DM. The impact of exposure to the thin-ideal media image on women. *Eat Disord* 2004;12:35-50.
 14. Monteath SA, McCabe MP. The influence of societal factors on female body image. *J Soc Psychol* 1997;137:708-27.
 15. Lindberg L, Hjern A. Risk factors for anorexia nervosa: A national cohort study. *Int J Eat Disord* 2003;34:397-408.
 16. Smith BG, Knight JK. An index for measuring the wear of teeth. *Br Dent J* 1984;156:435-8.
 17. Hara AT, Lussi A, Zero DT. Biological factors. In: Lussi A, editor. *Dental Erosion: From Diagnosis to Therapy*. Basel, Switzerland: Karger; 2006. p. 88-99.
 18. Lussi A, Jaeggi T. Chemical factors. In: Lussi A, editor. *Dental Erosion: From Diagnosis to Therapy*. Basel, New York, USA: Karger; 2006. p. 77-87.
 19. Bartlett D, Phillips K, Smith B. A difference in perspective-the North American and European interpretations of tooth wear. *Int J Prosthodont* 1999;12:401-8.
 20. Lussi A, Jaeggi T. Erosion-diagnosis and risk factors. *Clin Oral Investig* 2008;12 Suppl 1:S5-13.
 21. Bartlett DW. The Relationship between Gastro-Oesophageal Reflux and Dental Erosion, Ph.D. Thesis. London, UK: United Medical and Dental Schools of Guy's and St. Thomas' Hospitals, University of London; 1995.
 22. Treasure J, Schmidt U, Troop N, Tiller J, Todd G, Keilen M, *et al*. First step in managing bulimia nervosa: Controlled trial of therapeutic manual. *BMJ* 1994;308:686-9.
 23. Wilder-Smith CH, Wilder-Smith P, Kawakami-Wong H, Voronets J, Osann K, Lussi A. Quantification of dental erosions in patients with GERD using optical coherence tomography before and after double-blind, randomized treatment with esomeprazole or placebo. *Am J Gastroenterol* 2009;104:2788-95.
 24. UK Department of Health/British Association for the Study of Community Dentistry. *Delivering Better Oral Health: An Evidence-Based Toolkit for Prevention*. London: UK Department of Health; 2009.
 25. Azzopardi A, Bartlett DW, Watson TF, Sherriff M. The surface effects of erosion and abrasion on dentine with and without a protective layer. *Br Dent J* 2004;196:351-4.
 26. Strauss RP, Hunt RJ. Understanding the value of teeth to older adults: Influences on the quality of life. *J Am Dent Assoc* 1993;124:105-10.
 27. Nalbandian S, Millar BJ. The effect of veneers on cosmetic improvement. *Br Dent J* 2009;207:E3.
 28. Kelleher MG. The 'daughter test' in aesthetic ('esthetic') or cosmetic dentistry. *Dent Update* 2010;37:5-11.
 29. Holbrook WP, Arnadóttir IB, Kay EJ. Prevention. Part 3: Prevention of tooth wear. *Br Dent J* 2003;195:75-81.
 30. Edelhoff D, Sorensen JA. Tooth structure removal associated with various preparation designs for anterior teeth. *J Prosthet Dent* 2002;87:503-9.
 31. Poyser NJ, Briggs PF, Chana HS, Kelleher MG, Porter RW, Patel MM, *et al*. The evaluation of direct composite restorations for the worn mandibular anterior dentition-clinical performance and patient satisfaction. *J Oral Rehabil* 2007;34:361-76.
 32. Hemmings KW, Darbar UR, Vaughan S. Tooth wear treated with direct composite restorations at an increased vertical dimension: Results at 30 months. *J Prosthet Dent* 2000;83:287-93.
 33. Redman CD, Hemmings KW, Good JA. The survival and clinical performance of resin-based composite restorations used to treat localised anterior tooth wear. *Br Dent J* 2003;194:566-72.
 34. De Munck J, Van Landuyt K, Peumans M, Poitevin A, Lambrechts P, Braem M, *et al*. A critical review of the durability of adhesion to tooth tissue: Methods and results. *J Dent Res* 2005;84:118-32.
 35. Hanif A, Rashid H, Nasim M. Tooth surface loss revisited: Classification, etiology, and management. *J Res Dent* 2015;3:37-43.
 36. Mahalick JA, Knap FJ, Weiter EJ. Occusal wear in prosthodontics. *J Am Dent Assoc* 1971;82:154-9.