ACTA SCIENTIFIC DENTAL SCIENCES (ISSN: 2581-4893)

Volume 2 Issue 11 November 2018

Review Article

Dental Erosion: Etiology, Diagnosis and Management

Arjita Sengupta*

J.N. Wadia Medical Centre, Mumbai, India

***Corresponding Author:** Arjita Sengupta, J.N. Wadia Medical Centre, Mumbai, India.

Received: August 22, 2018; **Published:** October 08, 2018

Abstract

Dental erosion is caused by acid softening the substance of tooth resulting in tooth wear. The etiology is multifactorial with the main factors being the acids of intrinsic and extrinsic origin. With clinical appearance being the decisive factor for diagnosis, it is of utmost importance that the oral health care team is able to detect the early clinical signs and symptoms of erosion. At present, it is a disorder on rise and the purpose of this study is to provide information on early diagnosis and identification of etiological factors. Prevention should be the first choice and can be achieved with proper diet, oral hygiene and regular dental care. When necessary, treatment aimed at correcting or improving its effects might best be of a minimally invasive nature. Besides this, the Basic Index Erosive Wear Examination (BEWE), created in 2008, is an auxiliary diagnosis tool for assessing the status and progress of the erosion.

Keywords: Erosion; Tooth Wear; Prevention

Introduction

Dental erosion has been defined as a chemical process that involves the dissolution of enamel and dentine by acids not derived from bacteria when the surrounding aqueous phase is undersaturated with respect to tooth mineral [1]. Firstly, an irreversible loss of dental hard tissue accompanied by a progressive softening of the surface occurs due to the acidic attack [2]. This eroded area is vulnerable to abrasive forces [4], unlike the normal tooth structure which has slight or no effect [3]. The effect of erosion can be due to either chemical or mechanical processes or both [5].

Diagnosis can be difficult in the early stage due to hardly any signs and even less symptoms. Acid exposure leads to simultaneous dilution of both hydroxyl- and fluorapatite in saliva, resulting in loss of tooth structure by layers [32]. Early erosion is difficult to identify optically and/or by tactual examination. Clinically, early enamel erosion appears as an even, shiny surface [6]. The intact enamel band along the gingival tooth margin has been deducted to be due to remaining plaque, acting as a barrier for acids or could be the acids counteract effect of the sulcular fluid [7].

Further progression of erosion can lead to edges of teeth being irregular and rough, pitting appearance of the surface and occlusal morphology being eventually lost. It is hard to determine dentin exposure; disclosing agents can be helpful [8]. When the surrounding tooth surface dissolves, the fillings may start to be prominent. As the case advances, distinguishing between the different tooth wear types becomes arduous as they may occur simultaneously. Caries do not occur at active sites of erosion patients, unless plaque is present.

The best way to treat erosion is to prevent it from happening in the first place. Patients usually don't seek treatment until they face hypersensitivity, or their esthetic aspect is in question. Dentists can aid in early recognition and prevention of dental erosion.

Etiology

The etiology of erosion is multifactorial and not fully understood. The interaction of chemical, biological and behavioral factors is the vital point and explains why individuals are affected in different ways even when exposed to the same acidic content [9].

There is proof that acidic food and drinks play a role in the occurrence of erosion. Consumables with pH below 5.0 - 5.7 are known to set off erosion effects [48]. These factors are chemical (buffering capacity, type of acid, calcium and phosphate concentration and fluoride content), behavioral (tooth brushing, eating and drinking habits, acidic drinks and food, vomiting, drugs, occupation, regurgitation) and biological (salivary flow and buffer, soft tissue movement, soft tissue vs. teeth, acquired dental pellicle, tooth anatomy, structure) [10] (Figure 1).

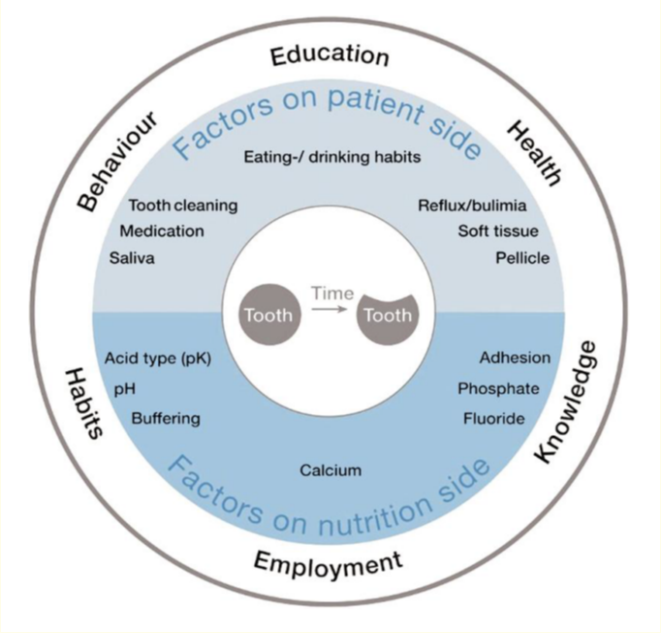

Figure 1: The different factors for the development of erosive tooth wear showing its multifactorial etiology [38].

Chemical factors

From the chemical point of view, the etiology of dental erosion can be defined as the chronic exposure of the teeth to extrinsic or intrinsic acids under the condition that the oral fluids are under saturated with respect to tooth mineral [11,12].

Extrinsic factors

Any acidic product that we put into mouth, that is, what we eat and drink are considered "extrinsic" factors. Another example is occupational-related erosion, like people who are wine tasters and among battery and galvanizing workers, often caused by airborne acid that reaches the teeth [13-18]. A rise in the intake of soft drinks which are high in acidic composition has been observed in recent years [19]. We can say that soft drinks are the ruling factor in inducing dental erosion in the younger generations [20, 21–23]. Extrinsic factors include acidic foods and beverages like lemon juice, wine, sports drinks, cherries, soda, oranges and others [24] and some medicines- such as vitamin C tablets and tonics.

Intrinsic factors

The "intrinsic" factors include several ailments and lifestyles, which lead to regurgitation of acids into the oral cavity. In these cases, for example in patients suffering from psychological disorders, e.g., in anorexia and bulimia [25] and gastro esophageal reflux disease (GERD), vomiting and regurgitation, there is an increased risk for erosion [26-30]. The pH of stomach acid is much lower than the critical pH of enamel dissolution; therefore, reflux of stomach contents into the oral cavity over an extended period of time can cause severe loss of tooth structure. Low salivary flow is another element that results in inadequate cleansing and mitigation of the effects of erosive acids on tooth surfaces [31].

Behavioral Factors

Lifestyle has a crucial role in the occurrence of erosion. Eating habits and increased consumption of beverages and foods with a high acid content have been strengthened in the last few decades. The erosive potential of drinks is mainly represented by their pH and the buffering capacity. In previous reports, the initial pH values of some soft drinks and their buffering capacities were determined. Aerated drinks are more acidic than fruit juices. Therefore, buffering capacities are in the decreasing order of fruit juices, fruit-based aerated drinks, non-fruit based aerated drinks [33,34].

Proper oral hygiene measures might have an effect on the development of erosion. Tooth brushing is known to remove the brittle, eroded surface of tooth. Progression of dental wear might be influenced by the motion of tooth brushing after acid attack [35,36] and the type of toothbrush and toothpaste used [37].

Biological factors

Salivary protective properties, its flow rate and buffering capacity, acquired dental pellicle and tooth morphology and positioning in relation to soft tissues and tongue affect the outcome of hard tissue erosion [39].

Diagnosis

Detailed familiarity with the current science of dental erosion etiology and a differential diagnosis are critical before any dietary or behavioral pattern can be associated with the observation of tooth structure loss. It is important to maintain records of photographs and study models to track progression. Also, salivary tests should be performed to check the flow rate and buffering capacity [40]. A thorough case history will also undoubtedly involve consultation with the patient's physician.

Medical history must include information regarding any systemic conditions that influence the salivary flow, use of any chronic medication, gastric reflux, heartburn, acid mouth taste frequent vomiting and so forth. Dental history regarding jaw parafunction and bruxism should also be taken. Patient's occupation and recreational habits must also be recorded in the history.

As a means of measurement, numerous indices to standardize diagnostic clinical criteria have been used for more than twenty years. Some of them are the Eccles Index in 1979, the Smith and Knight Tooth Wear Index (TWI) in 1984, the index by Linkosalo and Markkanen in 1985, the erosion Index modified by Lussi in 1996, among others [41]. However, there is no agreement on a standard index to assess the current status and progress of the dental erosion [42]. Currently, the Basic Erosive Wear Examination (BEWE) has been developed with the purpose of establishing, validating and standardizing the criteria internationally [43-44]. Total mouth score of 0 to 2 shows no risk; 3 to 8 is low risk; 9 to 13 is medium risk; 14 and more is high risk (Figure 2).

Diagnosis is the foundation to properly plan and execute the treatment. The erosion rates are a method to analyze the status and progress of the dental erosion and thus achieve a reliable diagnosis

Score	Description
0	No erosive tooth wear (no surface loss)
1	Initial loss of enamel surface texture
2[a]	Distinct defect, hard tissue loss (dentine) <50 % of the surface area
3[a]	Hard tissue loss >50 % of the surface area
[a]in scores 2 and 3, dentine often is involved	

Figure 2: Basic erosive wear examination.

Management

A complete clinical management follows the identification of causes for erosion. It comprises of-

- Preventive Management
- Restorative Management

Preventive Management

The key elements in the prevention of dental erosion irrespective of the etiology of erosion includes patient education and compliance with diet modification, occlusal splints etc. A complete protocol for prevention of erosion is given in figure 3.

Preventive Measures:

1. **Diminish the frequency and severity of the acid challenge.**
   - Decrease amount and frequency of acidic foods or drinks.
   - Acidic drinks should be drunk quickly rather than sipped. The use of a straw would reduce the erosive potential of soft drinks.
   - If undiagnosed or poorly controlled gastroesophageal reflux is suspected, refer to a physician.
   - In the case of bulimia, a physician or psychologist referral is appropriate.
   - A patient with alcoholism should be assisted in seeking treatment in rehabilitation programs.
2. **Enhance the defense mechanisms of the body (increase salivary flow and pellicle formation).**
   - Saliva provides buffering capacity that resists acid attacks. This buffering capacity increases with salivary flow rate.
   - Saliva is also supersaturated with calcium and phosphorus, which inhibits demineralization of tooth structure.
   - Stimulation of salivary flow by use of a sugarless lozenge, candy or gum is recommended
3. **Enhance acid resistance, remineralization and rehardening of the tooth surfaces.**
   - Have the patient use daily topical fluoride at home.
   - Apply fluoride in the office 2-4 times a year. A fluoride varnish is recommended.
4. **Improve chemical protection.**
   - Neutralize acids in the mouth by dissolving sugar-free antacid tablets 5 times a day, particularly after an intrinsic or extrinsic acid challenge.
   - Dietary components such as hard cheese (provides calcium and phosphate) can be held in the mouth after acidic challenge (e.g., hold cheese in mouth for a few minutes after eating a fruit salad).63
5. **Decrease abrasive forces.**
   - Use soft toothbrushes and dentifrices low in abrasiveness in a gentle manner.
   - Do not brush teeth immediately after an acidic challenge to the mouth, as the teeth will abrade easily.
   - Rinsing with water is better than brushing immediately after an acidic challenge.
6. **Provide mechanical protection.**
   - Consider application of composites and direct bonding where appropriate to protect exposed dentin.
   - Construction of an occlusal guard is recommended if a bruxism habit is present.
7. **Monitor stability**
   - Use casts or photos to document tooth wear status.
   - Regular recall examinations should be done to review diet, oral hygiene methods, compliance with medications, topical fluoride and splint usage.

Figure 3: Protocol for the prevention of the progression of erosion [45].

Restorative Management

There is no long-standing documentation of restorative procedures and materials that has been proven to be appropriate in case of erosive damage and hence, the restorative treatment decision should be made with care [46].

Depending on the amount of tooth damage, restorative treatment can vary. Composite and porcelain restorations can be used in the esthetic zones. Cast alloy restorations can be used on the occlusal and palatal surfaces. Prevention of erosion will increase the chances of long term results in restorative treatment [47].

Conclusion

The impact of wear is usually progressive but can be slow. As a consequence of tooth wear, short clinical crown and bone loss is observed which further makes the treatment complicated. Recognizing the early signs of wear and erosion should stimulate the need for prevention in an endeavor to prolong the life of teeth. The presence of dentine hypersensitivity and unstained tooth surfaces is often the only clinical manifestation of active tooth wear [45]. The acids, mainly from food, are the primary cause of dental erosion. Emphasis should be made on preventive strategies as the main form of management. Further research is necessary to develop advanced measures which will be clinically efficient and have greater preventive ability [47,48].

Bibliography

1. Huysmans., *et al*. "Clinical Studies of Dental Erosion and Erosive Wear". *Caries Research* 45(2011): 60-68.

2. Lussi A. "Erosive tooth wear - a multifactorial condition of growing concern and increasing knowledge". *Monographs in Oral Science* 20 (2006): 1-8.

3. Addy M and Hunter ML. "Can tooth brushing damage your health? Effects on oral and dental tissues". *International Dental Journal* 53 (2003): 177-186.

4. Rios D., *et al*. "Influence of toothbrushing on enamel softening and abrasive wear of eroded bovine enamel: an in situ study". *Brazilian Oral Research* 20 (2006): 148-154.

5. Addy M and Shellis RP. "Interaction between attrition, abrasion and erosion in tooth wear". *Monographs in Oral Science* 20 (2006): 17-31.

6. Magalhães AC., *et al*. "Insights into preventive measures for dental erosion'. *Journal of Applied Oral Science* 17 (2009): 75-86.

7. Lussi A., *et al*. "The role of diet in the aetiology of dental erosion". *Caries Research* 38 (2004): 34-44.

8. Ganss C., *et al*. "Accuracy and consistency of the visual diagnosis of exposed dentine on worn occlusal/incisal surfaces". *Caries Research* 40 (2006): 208-212.

9. Lussi A and Jaeggi T. "Erosion--diagnosis and risk factors". *Clinical Oral Investigations* 12 (2008): S5-S13.

10. Lussi A., *et al*. "The role of diet in the etiology of dental erosion'. *Caries Research* 38 (2004): 34-44.

11. Larsen MJ. "Chemical events during tooth dissolution". *Journal of Dental Research* 69 (1990): 575-580.

12. Featherstone JD and Lussi A. "Understanding the chemistry of dental erosion". *Monographs in Oral Science* 20 (2006): 66-76.

13. AK Johansson., *et al*. "Silicone sealers, acetic acid vapors and dental erosion: a work-related risk?" *Swedish Dental Journal* 29 (2005): 61-69.

14. WM Amin., *et al*. "Oral health status of workers exposed to acid fumes in phosphate and battery industries in Jordan". *International Dental Journal* 51 (2001): 169-174.

15. ML Tuominen., *et al*. "Tooth surface loss and exposure to organic and inorganic acid fumes in workplace air". *Community Dentistry and Oral Epidemiology* 19 (1991): 217-220.

16. A Mulic., *et al*. "Dental erosive wear among Norwegian wine tasters". *Acta Odontologica Scandinavica* 69 (2010): 21-26.

17. HD Kim., *et al*. "Occupational exposure to acidic chemicals and occupational dental erosion". *Journal of Public Health Dentistry* 66 (2006): 205-208.

18. A Wiegand and T Attin, "Occupational dental erosion from exposure to acids-a review". *Occupational Medicine* 57 (2007): 169-176.

19. MF Jacobson. "Liquid candy: how soft drinks are harming Americans' health". (2005).

20. AK Johansson., *et al*. "Dental erosion, soft-drink intake, and oral health in young Saudi men, and the development of a system for assessing erosive anterior tooth wear". *Acta Odontologica Scandinavica* 54 (1996): 369- 378.

21. AK Johansson., *et al*. "Dental erosion associated with soft-drink consumption in young Saudi men". *Acta Odontologica Scandinavica* 55 (1997): 390-397.

22. T Jensdottir., *et al*. "Relationship between dental erosion, soft drink consumption, and gastroesophageal reflux among Icelanders". *Clinical Oral Investigations* 8 (2004): 91-96.

23. C Murakami., *et al*. "Risk indicators for erosive tooth wear in Brazilian preschool children". *Caries Research* 45 (2011): 121-129.

24. Ten Cate JM and Imfeld T. "Dental erosion, summary". *European Journal of Oral Sciences* 104 (1996): 241-244.

25. Knewitz JL and Drisko CL. "Anorexia nervosa and bulimia: a review". C*ompendium* 9 (1988): 244-247.

26. R Ohrn., *et al*. "Oral status of 81 subjects with eating disorders". *European Journal of Oral Sciences* 107 (1999): 157-163.

27. DW Bartlett., *et al*. "A study of the association between gastro-oesophageal reflux and palatal dental erosion". *British Dental Journal* 181 (1996): 125-131.

28. GR Wang., *et al*. "Relationship between dental erosion and respiratory symptoms in patients with gastro-oesophageal reflux disease". *Journal of Dentistry* 38 (2010): 892-898.

29. AK Johansson., *et al*. "Eating disorders and oral health: a matched case-control study". *European Journal of Oral Sciences* 120 (2012): 61-69.

30. N Schlueter., *et al*. "Influence of the digestive enzymes trypsin and pepsin in vitro on the progression of erosion in dentine". *Archives of Oral Biology* 55 (2010): 294-299.

31. Järvinen VK., *et al*. "Risk factors in dental erosion". *Journal of Dental Research* 70 (1991): 942-947.

32. Larsen and C Bruun. "Caries chemistry and fluoride mechanisms of action, in Textbook of Clinical Cariology, A. Thylstrup and O. Fejerskov Munksgaard, Copenhagen, Denmark, 2nd edition (1994): 231-257.

33. Edwards M., *et al*. "Buffering capacities of soft drinks: the potential influence on dental erosion". *Journal of Oral Rehabilitation* 26 (1999): 923-927.

34. Owens BM. "The potential effects of pH and buffering capacity on dental erosion'. *General Dentistry* 55 (2007): 527-531.

35. Attin T., *et al*. "In situ evaluation of different remineralization periods to decrease brushing abrasion of demineralized enamel". *Caries Research* 35 (2001): 216-222.

36. Attin T., *et al*. "Abrasion of softened and remineralizer dentin: an in situ study". *Caries Research* 38 (2004): 62-66.

37. Hooper S., *et al*. "Investigation of erosion and abrasion on enamel and dentine: a model in situ using toothpastes of different abrasively". *Journal of Clinical Periodontology* 30 (2003): 802-808.

38. Lussi A. "Erosive tooth wear - A multifactorial condition of growing concern and increasing knowledge. In: A. Lussi. Dental erosion: from diagnosis to therapy". Basel: Karger (2006): 1-8.

39. Hara AT., *et al*. "Biological Factors". *Monographs in Oral Science* 20 (2006): 88-99.

40. Nik Yusoff NNA., *et al*. "Fluoride release from dental restorations in de-ionized water and artificial saliva". *Journal of Internal Medicine.*

41. Bardsley PF. "The evolution of tooth Wear indices". *Clinical Oral Investigation* 12 (2008): 15-19.

42. Meyers I. "Attrition and erosion: assessment and diagnosis". *Annals of the Royal Australasian College of Dental Surgeons* 21 (2012): 94-96.

43. Bartlett D., *et al*. "Basic Erosive Wear Examination (BEWE): a new scoring system for scientific and clinical needs". *Clinical Oral Investigations* 12 (2008): S65-S68.

44. Bartlett D., *et al*. "A difference in perspective-the North American and European interpretations of tooth wear". *International Journal of Prosthodontics* 12 (1999): 401-408.

45. Pandey A., *et al*. "Wasting Disease: Erosion! A Diagnosis, Prevention and Management". *International Medical Journal* 21 (2014): 490-492.

46. A Johansson., *et al*. "Rehabilitation of the worn dentition," *Journal of Oral Rehabilitation* 35 (2008): 548-566.

47. Magalhães AC., *et al*. "Insights into preventive measures for dental erosion". *Journal of Applied Oral Science* 17 (2009): 75-86.

48. Mandel Louis. "Dental erosion due to wine consumption". *Journal of American Dental Association* 136 (2005): 71-75.

Volume 2 Issue 11 November 2018