

Management of Non-Carious Lesions: A Case Report

**Mansi Vandekar¹, Rashmi Misra², Khushboo Mehra³, Pavan Kumar⁴,
Roshan Vijay⁴, Parinita Agarwal⁵**

¹Professor & HOD, Department of Conservative Dentistry and Endodontics, D Y Patil School of Dentistry, Navi Mumbai, India;

²Professor, Department of Conservative Dentistry and Endodontics, D Y Patil School of Dentistry, Navi Mumbai, India; ³Lecturer, Department of Conservative Dentistry and Endodontics, D Y Patil School of Dentistry, Navi Mumbai, India; ⁴MDS 1st year, Department of Conservative Dentistry and Endodontics, D Y Patil School of Dentistry, Navi Mumbai, India; ⁵MDS 11th year, Department of Conservative Dentistry and Endodontics, D Y Patil School of Dentistry, Navi Mumbai, India.

ABSTRACT

Introduction: Non-carious lesions are caused as a result of tooth surface loss. Several categories of tooth surface loss exist, including erosion, attrition, abrasion and abfraction. Numerous factors, such as bruxism, clenching, disease, dietary considerations, lifestyle choices, improper tooth brushing, abrasive dentrifices, craniofacial complex, iatrogenic dentistry and ageing might contribute to this problem. It can be challenging to identify the cause, but it is feasible by observing the pattern of tooth surface loss on the teeth, and it is essential for treatment planning to avoid failure. Prevention, tooth remineralization and active treatment by repairing the affected teeth are all methods of managing this process. Treatment options include minimally invasive and adhesive dentistry to full mouth rehabilitation, and restoring the lost vertical height.

Case Report: A 45-year-old female patient reported to Department of Conservative Dentistry and Endodontics with a chief complaint of sensitivity in the upper front teeth for the past 2 months. The clinical examination showed abrasion on the buccal surface of teeth 13 and 23 with dentin exposure. And also, abfraction with respect to 14. No signs of mobility or pain on percussion.

Conclusion: The steps of problem identification, diagnosis, etiological factor removal or treatment, and, if necessary, restoration, are components of treating non-caries lesions. The restorative treatment must be considered for dentin hypersensitivity and for the re-establishing of dental esthetics.

Key Words: Non-Carious Lesions, Erosion, Attrition, Abrasion, Abfraction, Abrasive Dentrifices

INTRODUCTION

Teeth play a significant role in mastication, phonetics and esthetics. Partial or complete tooth tissue loss can happen with ageing, as well as a result of many pathological factors such as trauma, tooth lesions like caries as well as non-carious lesions. The outcomes may lead to unsatisfactory esthetics, impair oral functions, induce pain and sensitivity, and have a detrimental effect on quality of life. The mineralized tissue that makes up dental structure is subject to a dynamic process of demineralization and remineralization in the oral cavity.¹ The tooth structures lose calcium and phosphate ions when there is supersaturated and normal functioning saliva present. These are then taken up in the presence of fluoride, thus maintaining homeostasis. The permanent loss of mineral components from tooth tissue happens in response to chemical challenges and mechanical adversities, such as erosion, abrasion, attrition and abfraction. Wear is a process that

happens whenever a surface is exposed to another surface or to chemically active substances. Wear can result in a progressive removal of material from surfaces through mechanical or chemical action. Friction only results from the rubbing of one object or surface against another.¹

When assessing the long-term health of the dentition, non-carious lesions are playing an increasingly important role. In actuality, this condition is becoming more common. According to the present literature available, it is not possible to identify a single etiological factor, but there is concern that it is a multifactorial condition.² These lesions present unique challenges for successful restoration because they can impact tooth sensitivity, caries incidence, plaque retention, structural integrity and pulp vitality.² Each step of the restoration process - isolation, adhesion, insertion technique, finishing, and polishing are affected by these factors. A complete patient history, thorough evaluation, and careful obser-

Corresponding Author:

Dr. Mansi Vandekar, Professor & HOD, Department of Conservative Dentistry and Endodontics, D Y Patil School of Dentistry, Navi Mumbai, India; Email: mansi.vandekar@dypatil.edu

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vation are necessary for a good diagnosis and treatment plan. With the aid of effective case selection for therapy and the choice of suitable treatment protocols, this work intends to provide some knowledge of the characteristics and etiologic covariables of non-carious lesions and to enhance assessment of prognosis.²

Classification of Non-Carious Lesions Due to Tooth Surface Loss

The four general categories of tooth surface loss are as follows. However, in most cases, a combination of these factors typically causes tooth surface loss, which presents diagnostic and etiological challenges.¹

Erosion

Dental erosion is the pathological breakdown of dental hard tissues brought on by the chemical action of intrinsic or extrinsic acids without the presence of microorganisms. The surfaces of eroded teeth appear uneven, with ridges and grooves that are smooth and rounded. The patient's age and the loss of tooth surface are unrelated. The teeth could be hypersensitive to variations in temperature and touch. Caries is usually not common in patients with erosion.¹

Erosion-prone teeth also don't typically hold onto plaque. Softening is the process where-in enamel that has been exposed to acid loses minerals from a layer that extends a few micrometers below the surface. The most superficial layer of enamel will eventually dissolve to the point where it is completely gone when softening spreads deeper into the enamel over time. Intrinsic factors include vomiting, regurgitation, and acid reflux.¹

Extrinsic factors include exposure to acidic meals or beverages, such as carbonated beverages, sports drinks, soft drinks and lemons or other citrus fruits. Gastric acids with pH values less than 1.0 can enter the oral cavity and come into contact with the teeth in various circumstances, such as gastro-oesophageal reflux disease, severe vomiting linked to eating disorders, and pregnancy. Dental erosion was found to be a result of bulimia, anorexia nervosa or other eating disorders. Erosion of the palatal surfaces of the maxillary teeth is typically brought on by vomiting. Dental erosion can also be brought on by a variety of drugs that are used to treat various diseases.¹

Attrition

Attrition is the physiological wearing of dental hard tissues through tooth-to-tooth contact, without the intervention of foreign substances. It should in theory happen due to two-body wear, but mechanically it is difficult to distinguish from dental abrasion since enamel fragments that break off during attrition might behave as abrasive particles. The amount of force exerted, the kind of lubricant available, and the min-

eral composition of the tooth all affect the rate of attrition. It was believed that the relatively low mineral content of dentin made it more susceptible to wear at lower stresses, but that at higher loads, the fibrous organic matrix would serve to prevent fracture whereas the more heavily mineralized enamel would be devoid of this mechanism.¹

Clinically, when wear on opposing teeth is equal and results in matching facets, wearing of occlusal surfaces is frequently attributed to attrition. Additionally, inter-proximal surfaces and buccal and lingual surfaces may become worn with time, especially with specific malocclusions. Beyond the small amount that is deemed physiological, pathological levels of occlusal surface wear are linked to parafunctional habits, particularly bruxism.¹

Abrasion

When used strictly, the word "abrasion" refers to "a wearing of one surface against another via friction." Abrasion results from friction between the tooth substrate and any extrinsic agent. Also due to friction from the food bolus, masticatory abrasion frequently occurs on incisal and occlusal surfaces.³ Over the course of a lifetime, routine teeth cleaning procedures cause some tooth abrasion. Abrasion with toothbrushes is regulated by numerous factors. According to some estimates, horizontal brushing might result in up to three times the wear of vertical brushing. The rate of abrasion increases further if bristles are in contact with the tooth surface for an extended period of time. Abrasion is greatly influenced by the force and frequency that has been applied to the brush. Although brushing pressure varies depending on each individual's brushing method, bristle stiffness, age and brushing habits.³

In comparison to the neighboring tooth surface the lesions edges are sharply demarcated. The lesion surface is extremely polished and smooth. Pain may be produced by stimulating or probing the lesion.³

Abfraction

A relatively new term, "abfraction," was recently coined by Grippo to describe the loss of dental tissues caused by stress-induced non-carious lesions. Abfraction is the fourth category of wearing process.¹

Grippo listed five types of abfraction, comprising of invagination of the cusp tip and hairline cracks, striations, saucer-shaped, and semilunar-shaped lesions.³

The main idea behind the theory of abfraction, which was put forth to explain how wedge-shaped non-carious cervical lesions could form, is that off-axis loading of tooth cusps would result in microcrack formation in the cervical region due to tensile stress concentrations, especially in the enamel, which is less resilient to tensile stress than dentin. The cervical region would be more vulnerable to erosion and abrasion

as a result. There is conflicting research that suggests abfraction plays a significant role in tooth wear.¹

Many assessments of stress distributions in loaded teeth have used unrealistic dental structural models or have produced results that are inconsistent with the expectations of the abfraction theory, despite the fact that many of these analyses have supported the idea of cervical stress concentrations. By brushing teeth that are either unloaded or continuously under axial load, wedge-shaped cervical lesions can be produced *in vitro*. Additionally, off-axis loading showed no noticeable effect, while axial loading significantly decreased the cervical tooth brushing wear. Periodic off-axis stressing of whole tooth crowns increased the rate of erosion of cervical enamel in 1% lactic acid, pH 4.53. Staninec et al. discovered that tissue loss from dentin beams subjected to bending stress was larger at pH 6 than at pH 7, although contrary to the abfraction theory, more wear occurred on the compression surface of the beam than on the tension surface.¹

CASE REPORT

A 45-year-old female patient reported to Department of Conservative Dentistry and Endodontics with a chief complaint of sensitivity in the upper front teeth for the past 2 months. The clinical examination showed abrasion on the buccal surface of teeth 13 and 23 with dentin exposure. And also, abfraction with respect to 14. No signs of mobility or pain on percussion. On Radiographic examination, no periapical radiolucency or pulpal exposure was seen. Pulp sensibility test was conducted using the cold test method and both 13 and 23 showed a positive response. Further, the patient also reported the use of a rigid dental brush and the use of excessive force during brushing.

Diagnosis: Abrasion with respect to 13 and 23. Abfraction with respect to 14.

Treatment plan: A direct composite restoration with a Glass ionomer base in 13 and 23. Direct composite restoration in 14. Patient educated about proper brushing techniques.

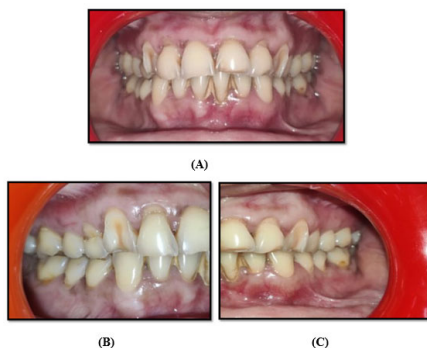


Figure 1 (A, B, C): Pre-op Images showing abrasion with respect to 13 and 23 and Abfraction in relation to 14.



Figure 2 (A, B): Rubber dam isolation done.



Figure 3 (A, B): A layer of GIC base (GC Gold Label Type 2) is given on 13 and 23 to reduce dentin hypersensitivity.



Figure 4: Shade matching is done. A2 shade was selected using composite buttons placed on adjacent teeth.

Universal (all in one) bonding agent applied and cured. (3M ESPE). Nano hybrid packable composite (3M) of shade A2 was placed in an incremental manner. The photopolymerization was performed for 20 seconds using a LED light device.

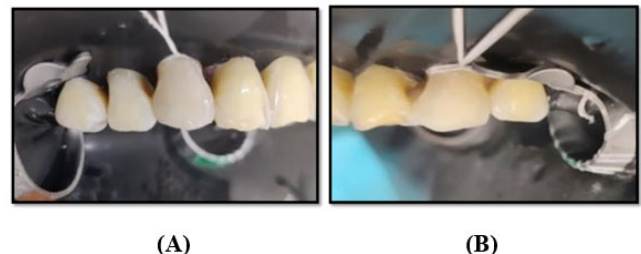


Figure 5(A, B): Polishing was done using SHOFU SNAP-KIT polishing disc using a micromotor.

DISCUSSION

The initial step in treating non-carious lesions is to stop or prevent their progression by addressing any probable etiologic factors that may be connected to these lesions. To achieve this, the patient should be advised to refrain from consuming acidic fruits and to brush with vertical movements, while exerting minimal force for brief periods of time. Three times less wear and tear are caused by vertical brushing than by horizontal brushing.⁵ In order to prevent premature contacts and promote a balanced occlusion, a thorough occlusal adjustment should also be carried out. This frequently necessitates the repair of deficient occlusal restorations that do not permit enough contact with the opposing tooth.⁴

Abrasion is the most cited etiological factor for development of non-carious lesions. According to clinical research, tooth brushing is the most likely cause, according to 66% of dentists. There was no evident preference among the various treatment modalities tested. The prevailing view is that toothbrush factors such as excessive tooth brushing, improper or vigorous technique, filament stiffness or design, dominant hand dexterity or abrasive dentifrices are to blame for cervical toothbrush abrasions. However, because of conflict findings, investigators are unable to definitively establish one element as the underlying etiology. Therefore, a variety of toothbrush-related factors may interact with dental erosion and occlusal loading. However, this etiology is controllable. Patients' questions should be answered, they should be taught proper brushing techniques, and some of the above factors need to be changed in order to see results.

Enamel is typically quite hard and difficult to erode, protecting the dentin beneath, which erodes 25 times more quickly. The most delicate of all tissues, cementum has a 35 times greater rate of wear than enamel. This explains why cervical lesions are more common and severe in elderly people. As people get older, gingival recession exposes the cementum, making the tooth far more vulnerable to abrasion even when maintaining the previously non-damaging oral hygiene.³

The difficulty in controlling moisture is one of the challenges in restoring these lesions. In this case, rubber dam was used for complete isolation.²

In patients with non-carious lesions, loss of enamel and exposure of dentinal tubules to the oral environment result in sensitivity issues. The occurrence of hypersensitivity is intermittent, occurring and disappearing at different times. Reparative dentin production takes place over time, rendering slowly progressing lesions asymptomatic.⁶

The first option for restoring non-carious lesions should be restorative materials with low modulus of elasticity. Glass ionomer should be used when aesthetics is not a factor because these restorations demonstrated the best outcomes in terms of therapeutic efficacy. The gold standard for restor-

ing these lesions is, however, methacrylate-based composites because of its superior mechanical and better aesthetic qualities compared to glass ionomers. Micro-filled composites demonstrate a greater elasticity than hybrid composites, even presenting excellent polishing properties. Because of its mechanical qualities and good polishing, a nanohybrid composite was chosen in this case to restore the patient's defects. It's critical to polish these restored surfaces to reduce biofilm adhesion in order to prevent inflammation and gingival recession.⁴

Treatment modalities

- A detailed history of the patient needs to be taken to diagnose the cause of presented abrasion.
- Correct the habit/ Eliminate the habit.
- Desensitize the exposed dentin if required before starting the restorative treatment.
- Restoring the defects with suitable restorative material (RMGIC/Composite)
- Surgical retraction of flap may be required for restoration of severe non carious lesions. A mini flap surgical retraction may help provide access to subgingival lesions.²

Follow-up

Three months after the end of restorations, the patient was contacted for follow-up. When questioned about oral health the patient reported that the dental treatment performed resulted in a better quality of life mainly due to the absence of hypersensitivity to thermal (cold) and air stimulus. The patient changed her brushing habits, performed the oral hygiene measures according to instruction given.

CONCLUSION

The steps of problem identification, diagnosis, etiological factor removal or treatment, and, if necessary, restoration, are components of treating non-carious lesions. The restorative treatment must be considered for dentin hypersensitivity and for the re-establishing of dental esthetics.⁴ It is not a simple process because of the multifactorial nature. A complete patient history, as well as thorough observations and evaluations, are necessary for a successful diagnosis and treatment approach.²

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REFERENCES

1. Ravi RK, Krishnaalla RA, Mohammed SH, KSV R. Non-Carious lesions due to tooth surface loss: A Review. Dent Era-A Journal of Dentistry. 2013 Sep;3(3):35-40.
2. Perez CD, Gonzalez MR, Prado NA, De Miranda MS, Macêdo MD, Fernandes BM. Restoration of non-carious cervical lesions: when, why, and how. Int J Dent. 2012;2012:687058
3. Venkatesan K, Kuzhanchinathan M, Prakash P. Critical review of non-carious cervical lesions. SRM Journal of Research in Dental Sciences. 2018 Apr 1;9(2):74-78
4. Mathias C, Ferraz LN, Lima DA, Marchi GM. Treatment of non-carious lesions: Diagnosis, restorative materials and techniques. Braz. J. Oral Sci. 2018 Jul. 13;17:e18336.
5. Jaeggi T, Lussi A. Toothbrush abrasion of erosively altered enamel after intraoral exposure to saliva: an in-situ study. Caries Res. 1999 Nov-Dec;33(6):455-61.
6. Joshi N, Shrestha S, Ghatrri A, Sundas S, Wagle SD, Prajapati K. Non-carious lesions among patients attending department of conservative dentistry and endodontics of a dental college. J Nepal Dent Assoc. 2020 Jul;20(31):111-4.