

# Management of non carious cervical tooth lesion by Nano-Ionomer: A case report

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## Abstract:

*Many noncarious lesions are being considered since a long with etiology of tooth structure loss that includes attrition, abrasion, erosion and abfraction. In this case report, the patient presented with the complaint of moderate hypersensitivity on his lower right premolar teeth. On clinical examination, his cervical region with smooth shiny surfaces. On vitality test with ice stick, the offending teeth showed more sensitivity comparing to adjacent teeth. A diagnosis of multiple cervical abrasions was made and treated with nano-ionomer (Glass-ionomer with nano-technology) as a restorative material with a high level of patient satisfaction. However, a long term clinical observation is necessary.*

*Key words: Non carious cervical lesion, Abrasion, Nano-ionomer.*

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## Introduction:

Non carious cervical lesion (e.g. abrasion, erosion and abfraction) is a significant dental health problem. The areas of non carious cervical lesions are considered as one of the most difficult areas of restoration, because it usually occurs due to loss of hard tissues at the cement-enamel junction or its adjoining one third portion of the crown/root<sup>1</sup>.

Furthermore, they are usually seen in the region of plaque accumulation such as near the gingival or under proximal contact. The lesions are characterized by the formation of smooth, polished surfaces, irrespective of their aetiology. Another characteristic of this lesion is many patients complaint of severe sensitivity and it may affect the vitality of the pulp tissue.

There are many of this condition, including bruxism, clenching, dietary factors, habits and lifestyle, incorrect tooth brushing, abrasive dentifrices, the craniofacial complex and aging.

Non carious Tooth Surface Loss(TSL) may be physiological or pathological. Several factors however, including attrition, abrasion and erosion can render tooth surface loss pathological. As a result of this symptoms may develop and treatment may be indicated. Criteria of physiological TSL are change in the appearance of teeth, Pain or sensitivity, loss in occlusal vertical dimension, loss in post occlusal stability resulting in increased tooth wear, mechanical failure of teeth or restoration, hypermobility or drifting. The feature of pathological TSL is sensitivity to thermal stimuli, A loss in vertical height, A history of frequent fracture of teeth on restorations, hyper mobility and drifting.

Tooth wearing as a result of mechanical process involving exogenous made (foreign substance or objects). The exogenous materials are anything that is foreign (subject or object) to tooth substance included are sand, gritty substance and foreign material found in the food bolus, the natural abrasiveness of some foods and any solid material held by or forced against the teeth. Abrasion may therefore occur during mastication, when the teeth are being used as tools or during tooth cleaning<sup>2</sup>.

A special form of abrasion is demastication, which means wear from chewing food (e.g. betel leaf chewing). In general the action of abrasion is not selective of the tooth surface. The abrasion influence of a bolus of food is felt on the whole occlusal surface, affecting cusp inclines and fissures as well as to a lesser degree the occlusal aspects of the

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buccal and lingual surfaces. The resulting morphology of defects can be diffuse or localized depending on the predominant impact. An exception to lack of specificity may occur when the same two or three teeth are used repeatedly as tools for grasping an object. This may lead to more abrasion to these teeth. Examples of this type of abrasion may be related to a broad range of occupations and pursuits from hunter-gathering to pipe smoking.

In abrasion areas as distinct from an attrition facet, is generally not well defined, because abrasion tends to round off or blunt tooth cusps or cutting edges, in addition to tooth surfaces have a pitted appearance. Where dentin is exposed it may be scooped out because it is softer than enamel. Microscopically an abraded surface generally shows haphazardly oriented scratch marks, numerous pits and various gouge marks on occlusal surface<sup>3</sup>.

Very rarely abrasive scratches will be almost parallel when abrasive material is forced one direction across the tooth surface. The length, depth and width of this micro detail vary depending on the abrasiveness of the food and pressure applied during mastication. The distribution and extent of the abrasive wear over the dentition is influenced by many variables including type of occlusion, diet, life style, age and oral hygiene.

According to literature it's not possible to determine unique etiological factor, but there is a concern that it is a multi factorial condition. Several preventive and restorative treatment modalities, such as occlusal adjustment, tooth brushing instructions, dietary advice, application of desensitization products and restorative procedures have been proposed for non carious cervical lesion. Clinicians have tried many restorative materials and techniques to obtain the best performance for these lesions. Therefore, a large variety of restorative materials having diverse aesthetic and bonding characteristics have been used. Conventional glass ionomers, resin modified glass ionomers, compomers and several types of resin composites have been used for cervical restorations. New materials are being introduced to address the need for restoring cervical lesions. Nano ionomer (Ketac<sup>TM</sup>N 100 restorative) is one such category used in the present case based on nano-technology in glass ionomer, which is a breakthrough in direct restoratives.

#### **Case report:**

A 38 year old male patient Mr. Abdur Rahim reported to the Department of Conservative Dentistry and Endodontics of this University with the complaints of moderate hypersensitivity on his lower right posterior

teeth. He gave the history of using hard tooth brush with horizontal stroke. On examination his mandibular right first and second premolar teeth found having loss of enamel in the cervical region with smooth shiny surfaces. On vitality test, when ice stick was placed on the adjacent and the offending teeth, the offended teeth showed more sensitivity comparing to the adjacent teeth. A diagnosis of multiple cervical abrasions was made. After considering the above conditions, restoration of the lesions by nano-ionomer was planned to perform.



*Before treatment*



*After treatment*

At first the consent of the patient was taken. After proper mouth preparation, isolation of the tooth with cotton rolls then dentine walls were slightly roughened by diamond bur. After selection of the shade (A3), Ketac™ N100 primer was applied over the cervical lesions. The primed surface was air dried for 10 seconds and light cured for another 10 seconds. Ketac™ N100 restorative paste-paste material was mixed on a paper pad for 20 seconds and placed into the cavity with a cement lifter. The restoration was then cured with a light curing unit for 20 seconds. Finally the restoration was finished with diamond finishing bur with water coolant and then polished with super-snap finishing and polishing discs (Shofu). The patient was advised for follow-up after 3, 6 and 12 months.

### Discussion:

Since the introduction of glass ionomer cements (GIC) in 1972, they have widened the armamentarium of tooth-colored restorative materials and in particular, they have been successfully used for restoration of cervical lesions. However, some severe shortcomings such as aesthetic inadequacy, inconvenient setting characteristics like sensitivity to desiccation and moisture contact during the early setting stages and low wear resistance against abrasion resulting from tooth brushing have limited their acceptance for the restoration of cervical lesions. In addition, the prolonged setting time makes finishing relatively difficult in the first 24 hours.

Resin Modified glass ionomer cements (RMGIC) were introduced in 1990 to overcome the problems of moisture sensitivity and low early mechanical strengths associated with the conventional GIC, which contain hydroxyethylmethacrylate (HEMA) or bisphenol-glycidyl methacrylate (BISGMA). The most important benefit of light curing glass ionomer is cure-on demand feature<sup>4</sup>.

Retention in modern restorative materials is dependent on a materials adhesion to tooth structure using mechanical and chemical bonding. This makes retention one of the most important criteria often used to determine the longevity of the restoration. Different studies showed good retention of all RMGIC when used in non-carious cervical lesions.

Color stability and color match are other factors influencing the choice of restorative material. Flowaczny and Louguercio found in their respective studies of 3 years and 5 years that RMGIC has poor color stability over time. This could be related to changes within the materials manifested as water and loss of anatomic form<sup>5</sup>.

To increase the longevity of the restoration recently (2007) nano-filled resin-modified glass-ionomer cement (Nano filled RMGIC Ketac™ N100 light curing nano ionomer Restorative, 3M ESPE), has been developed that combines the benefits of a resin modified light cured glass ionomer and bonded nano filler technology. Improved polish and aesthetics is the benefits of this combination, yet still provides the benefit of glass ionomer chemistry, such as high fluoride release that is rechargeable after being exposed to a topical fluoride source.

Ketac™ N100 restorative (nano filled RMGIC) contains a unique combination of two types of surface-treated Nanofillers (approximately 5-25 nm) and Nanoclusters (approximately 1-1.6 Micrometer) along with Fluoroaluminosilicate (FAS) glass. The filler loading is approximately 69% by weight. While nanofillers are primarily discrete non agglomerates, the nanocluster fillers are loosely bound to agglomerates of nano sized silica/ Zirconia that appear as a single unit, enabling higher filler loading, radio-opacity and strength.

In this case, Ketac™ N100 restorative was used because it's the unique two part paste technology. Its two part paste system provide faster, easier, less messy and more reproducible dispensing and mixing compared to conventional powder liquid systems.

Ketac™ N100 primer (3M ESPE) is a one part, visible light cure liquid specially designed for use with Ketac™ N100 restorative. Its acidic in nature and comprised of methacrylate modified polyalkenoic acid, HEMA, water and photo initiators. Its function is to modify the smear layer and adequately wet the tooth surface to facilitate adhesion of the restorative to the hard tissue<sup>6</sup>.

Some studies reported that nano filled RMGIC (Ketac™ N100) showed least micro leakage compared to conventional and resin modified glass ionomer.

Ketac™ N100 restorative is available in eight shades-A1, A2, A3, A3.5, A4, B2, C2 and blue. That ensures excellent aesthetics. It has been claimed by the manufacturers that the material takes initially high polish, close to composite and superior to some other RMGIC and the roughness values after toothbrush abrasion is similar to composite and superior to some RMGIC<sup>7</sup>.

An in vitro study done by some authors showed that surface finish of nanofiller GIC, was smoother than the other tested GICs after polishing. In this case, the restoration was assessed clinically. It was considered as aesthetically sound and the patient was pleased both aesthetically and functionally. However, a long term clinical observation is necessary.

**Conclusion:**

The unique properties of glass ionomers continue to make them an important part of everyday dentistry. For the quality and long lasting filling, it is necessary to choose the right material, to conduct correct restorative procedure and to maintain adequate oral hygiene. Based on the present case report together with the previous studies, it can be stated that Ketac™ N100 light curing nano Ionomer restorative is an ideal alternative to aesthetic glass ionomer cement for the modern dentistry.

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