

Quality Resource Guide

Managing Non-Carious Cervical Lesions (NCCLs)

Author Acknowledgements

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Dr. Sabir has no relevant financial relationships to disclose.

Educational Objectives

Following this unit of instruction, the learner should be able to:

1. Discuss the risk factors of NCCLs.
2. Analyze the diagnostic characteristics of NCCLs.
3. Outline management approaches for NCCLs.
4. Discuss the factors to consider when initiating a preventive protocol for NCCLs.
5. Implement the clinical guidelines for restoring NCCLs.

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Introduction

Non-Carious Cervical Lesions (NCCLs) manifest as a loss of mineralized tooth structure near the gingival margin. They typically extend from the cementoenamel junction (CEJ) onto the root surface,¹ and may negatively impact the dentition's structural integrity and esthetics.^{1,2} (Figure 1) NCCLs form as smooth saucer-like depressions or V-shaped notches.^{1,2} (Figure 2) Development generally progresses slowly over an extended period of time. This results in dental sclerosis and, usually, a lack of sensitivity for the patient.³ NCCLs are present in all age categories, including younger individuals.¹ (Table 1) Prevalence, severity and progression rate increase with age. This can be explained by the extended exposure to etiological factors and increased gingival recession and bone loss, exposing more root surfaces. Diminished quantity and quality of saliva in older individuals may also play a role.³

The prevalence of NCCLs reported in population groups varies widely, ranging from as high as 90% to as low as 10%.^{1,2} NCCLs are most commonly found on facial surfaces, and studies have identified that maxillary premolars are the most affected teeth.⁴

NCCLs typically have a multifactorial etiology; traditional contributing factors were identified as:

- Abrasion - usually attributed to excessive horizontal toothbrushing with stiff brushes and abrasive dentifrices
- Erosion - caused by consumption of acidic drinks and foods, gastroesophageal reflux disease, and medications or conditions that inhibit salivary flow

Occlusion has been reported as a contributing factor; however, this remains controversial.⁴ Over the past several decades, clinicians have reported NCCLs with an appearance that does not appear to have been caused solely by abrasion or erosion. A theoretical concept, termed abfraction, was developed implicating that occlusal trauma, tongue-thrusting or parafunctional loads such as bruxism, clenching, and nail-biting habits induce tooth flexure.^{5,6} It postulated that this flexure results in microfracture and tooth tissue loss at the cementoenamel junction, contributing to NCCLs.⁷

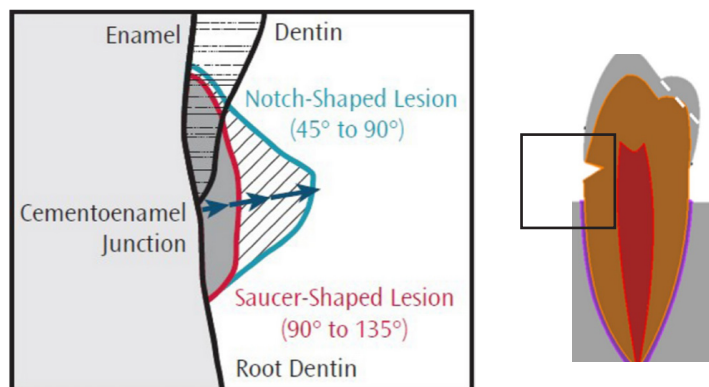
Abfraction is discussed as a conceptual causative factor for NCCLs throughout the dental clinical literature, and in-vitro, photoelastic and finite element analyses have shown stress concentration at the CEJ when a tooth is put under physical stress.⁷ However, no clinical evidence confirming anything other than association observations has been published.⁸ While abfraction does not meet the criteria of an evidence-based etiology for NCCLs, it will be included in this Quality Resource Guide as a potential contributor to the multifactorial etiology of NCCLs.

Figure 1



Multiple NCCLs on the Maxillary Teeth.

Figure 2



Schematics of a saucer-shaped non-carious cervical lesion that may progress toward a notch-shaped lesion. Left diagram - courtesy of the *Journal of the American Dental Association*.

Table 1 - Diagnostic Characteristics of NCCLs

Characteristics	Descriptions
Shape	Rounded saucer or notch-shaped
Dimensions	Depth and width (< 2mm)
The extent of dentin sclerosis	Mild to moderate
Sensitivity	No or mild sensitivity
Patient demographic information	Greater prevalence and severity in older patients
Most common tooth location	Maxillary premolars and molars

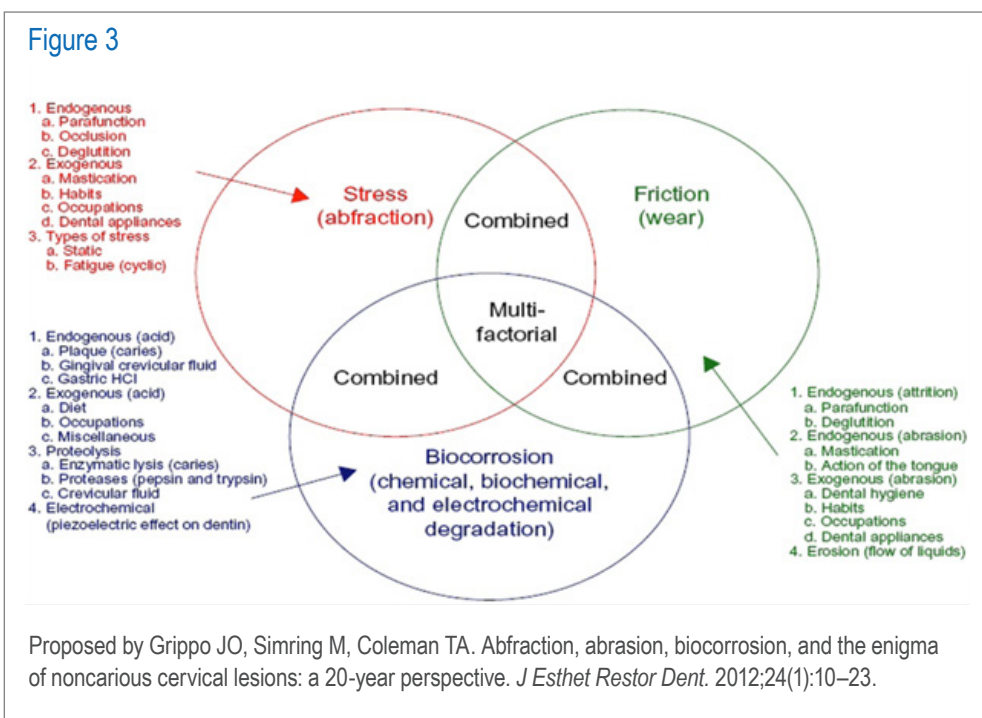
Assessing and Managing NCCLs: Clinical Decision-Making

There is always a dilemma associated with the management of NCCLs: “when to monitor or when to restore?”^{1,9} Grippo,⁷ substituting biocorrosion for erosion and friction for attrition, created a complex schema entitled Pathodynamic Mechanisms (Figure 3) to assist the dental provider. Following a complete medical/dental history review and a clinical examination, the clinician must assess the potential contributing factors to a patient’s NCCLs before initiating a management plan.^{3,7,10}

Following analysis, the provider should present their findings and conclusions to the patient. Together, they may determine the management approach:

- **Preventive Protocol** – adjust potential causative agents - introduce medicaments and agents to arrest or slow down progression – monitor carefully
- **Restorative Therapy** – replace missing tooth structure with a restorative material - monitor carefully

Regardless of the development mechanism, Goodacre, *et al.* note that NCCLs should be managed conservatively through preventive intervention with restorative treatment delayed until necessary due to lesion progression, impact on patient’s quality of life, sensitivity, poor esthetics, or food collection.¹ The slow progression of NCCL lesions, the capacity of self-defense from sclerotic dentin, and the lack of evidence for tooth weakening in the absence of a restoration support a conservative management philosophy.³ The lack of clinical trials, systematic reviews, or meta-analyses regarding when and how the treatment should be initiated suggests the provider should depend on conservative published recommendations such as “restorative intervention is typically best delayed as long as possible”.¹



Treatment Modalities for NCCLs: Prevention Protocol vs. Restorative Management

The generally slow progression rate of NCCLs represents important information that should be measured periodically to monitor any progression and establish an optimized recall interval.^{3,10} It has been suggested that quantifying the dimensions of the lesions allows them to be classified, recorded, and used to monitor.^{10,12,13}

Loomba, *et al.*¹³ proposed a system that documents the dimensions of the NCCL (Table 2):

- Axially (Depth - D)
- Orientation of the walls of the lesion (Angle - A)
- Occlusogingivally (Width - W)

Salam, *et al.*¹⁴ introduced the *Cervical Abrasion Index of Treatment Needs (CAITN)* for longitudinal monitoring, particularly in epidemiological studies. Measuring the depth of the cervical lesion and the mesiodistal and distolingual dimensions leads to quantifiable cervical abrasion (CA) and treatment needs (TN) indices that can be followed longitudinally.

The decision to monitor NCCLs and provide only preventive therapy should be based on the progression of the lesions and the determination that they are not compromising tooth vitality, structural integrity, function, esthetics, the design of planned therapy approaches, or the patient’s quality of life.^{10,15}

Table 2 - Proposed Clinical Classification of NCCLs¹³

Score	Buccolingual depth of the lesion (D)	Shape and angle of the lesion (A)	Occlusogingival width of the lesion (W)
1	≤ 1 mm	Notch-shaped, angle <90 degrees (acute)	≤ 1 mm
2	> 1 up to 2 mm	Saucer-shaped, angle 90 - 135 degrees (obtuse)	> up to 2 mm
3	> 2 mm	Saucer-shaped, angle >135 degrees	>2

Prevention Protocol for Managing NCCLs

The objectives of a preventive protocol are to stabilize existing NCCLs, prevent the progression of incipient lesions or the development of new ones, and assure the stability of restored lesions.³ Multiple factors are critical to the success of a preventive management approach for NCCLs:

- Early detection of incipient lesions is crucial to allow the initiation of behavioral changes and adjunct therapies.³
- Minimize intrinsic and extrinsic factors (improper toothbrushing, detrimental habits, diet, etc.) that may play a role in etiology.
- Initiate toothbrushing (soft bristles) with a fluoride-containing (low abrasive) dentifrice.
- Beware, while not substantiated by high-level evidence, power or sonic toothbrushes may lead to higher attrition of exposed dentin.³
- Recommend daily use of fluoride rinse or gels.*
- Schedule periodic professional fluoride applications.*
- Encourage the use of non-fermentable carbohydrate-containing gum or non-acidic saliva-stimulating products.³
- Initiate a potassium nitrate dentifrice to reduce sensitivity if it is an issue.^{12,16}
- Maintain close monitoring with clinical measurements and photographs at periodic recall appointments,

* An expanded discussion of fluoride therapy for adult patients may be found in the MetLife QRG – Amaechi, BT: “*The Role of Fluoride Therapy for Adults*”.

Restorative Therapy for NCCLs

Material Selection

Studies of the clinical performance of Class V composite resin restorations demonstrate superior esthetic and clinical outcomes compared to restoration with glass ionomer cement or polyacid-modified composite resins.¹⁸ Composite

resin restorations are thus widely recommended for restoring NCCLs as an effective method for preventing further deterioration.^{1,17} However, there are pros and cons related to each material type.¹⁹ Glass ionomer shows better retention than composites but exhibits inferior surface texture and color matching.²⁰ It has been proposed that placing a glass ionomer cement underneath a composite resin, entitled a sandwich or mixed technique, combines the positive characteristics of each material.^{1,6}

A specific material or placement method has not been scientifically identified to provide superior long-term outcomes when restoring NCCLs. Therefore, some authors state that it is a matter of the clinician's preference and experience regarding the material used.^{21,22} Goodacre, *et al.*, attempting to assist clinicians by assessing available evidence, have recently published *Proposed Clinical Guidelines for Restoring NCCLs*.¹ These guidelines include:

- **Isolation of the lesion**
 - o The use of rubber dam isolation results in significantly higher restoration retention.
 - o However, using a rubber dam clamp could contribute to gingival recession - use a retraction cord as an alternative isolation method if necessary.
- **Surface preparation of the lesion**
 - o Slightly remove surface dentin using a fine-grit rotary diamond instrument.
- **Use of mechanical retention**
 - o There is no evidence documenting an adverse effect from conservative mechanical retention.^{23,24} It is proposed that two rounded depressions be prepared into the cervical floor of the lesion and two into the occlusal wall of a posterior tooth.
- **Enamel beveling**
 - o There is no evidence indicating a negative effect from beveling the enamel. It increases the bonding area and enhances the esthetic outcome. It is recommended to bevel the enamel.

- **Adhesive agent**
 - o Both multistep and single-step adhesives may be used effectively
- **Enamel etching**
 - o Enamel should be etched per the manufacturer's recommendations
- **Dentin etching**
 - o The dentin surface is typically sclerotic; it is proposed that a 30-second dentin etching time with 37% phosphoric acid be used. Since both the enamel and dentin need to be etched, the etching can be started with the dentin surface, and after 15 seconds, the application can be extended to the enamel surface for the remaining 15 seconds.
- **Adhesive agent application technique**
 - o Adhesive agents should be applied with a disposable micro-brush applicator using a light scrubbing motion for at least 20 seconds.
- **Restorative material**
 - o Composite resins are the primary clinically acceptable material to restore NCCLs.
- **Type of composite resin**
 - o Flowable composite resins are easier to manipulate into deep areas and move around the surfaces of NCCLs. Flowable composite resins are also easier to place in small increments and manipulate into retentive areas. If the lesion is large, apply and polymerize a layer of flowable composite resin and then add an external layer of sculptable composite resin to enhance wear resistance.
- **Follow-up**
 - o The clinician must closely monitor restored NCCLs. Bonding to sclerotic dentin is subject to failure, and staining of the restorative margins and continued loss of surrounding dentin are possible.

Conclusion

The etiology of NCCLs is generally accepted to be multifactorial, although evidence to implicate factors other than abrasion and erosion is very weak. The dental provider must address the existing clinical condition regardless of the etiology. Following a

thorough assessment, the patient must be informed of their condition and the unknowns that may surround its cause. Together, the provider and the patient must decide on a philosophy of management: Prevention or Restorative. Generally, restorative intervention is typically best delayed as long as

possible. A preventive approach should focus on adjusting potential causative agents, introducing medicaments and agents to arrest or slow down progression, and careful monitoring. If restoration is considered prudent, the *Proposed Clinical Guidelines for Restoring NCCLs*¹ should be followed.

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POST-TEST

Internet Users: This page is intended to assist you in fast and accurate testing when completing the “Online Exam.” We suggest reviewing the questions and then circling your answers on this page prior to completing the online exam.

(1.0 CE Credit Contact Hour) Please circle the correct answer. 70% equals passing grade.

1. **The following factors support a conservative management approach for NCCLs:**
 - 1) **The presence of sclerotic dentin**
 - 2) **Their slow progression**
 - 3) **Aggressive care is usually unsuccessful**
 - a. 1) only
 - b. 2) only
 - c. 3) only
 - d. 1) and 2) only
 - e. 1), 2) and 3)
2. **Daily self-care for the individual with NCCLs may include:**
 - 1) **Diet change**
 - 2) **Use of topical fluoride**
 - 3) **Using a sonic toothbrush**
 - a. 1) only
 - b. 1) and 2) only
 - c. 2) and 3) only
 - d. All of the above
 - e. None of the above
3. **NCCLs may be found in:**
 - 1) **Older men**
 - 2) **Middle-aged women**
 - 3) **Pregnant young women**
 - a. 1) only
 - b. 1) and 2) only
 - c. 1) and 3)
 - d. 2) and 3) only
 - e. 1), 2) and 3)
4. **NCCLs are most commonly found on:**
 - 1) **Incisors**
 - 2) **Canines**
 - 3) **Molars**
 - a. 1) only
 - b. 2) only
 - c. 3) only
 - d. 2) and 3) only
 - e. None of the above
5. **An individual’s chance of having an NCCL is:**
 - a. Always greater than 60%
 - b. Always less than 50%
 - c. Always greater than 30%
 - d. Always less than 40%
 - e. Widely variable
6. **If a provider decides to restore an NCCL, the material of choice is:**
 - a. Glass ionomer
 - b. Polyacid-modified cement
 - c. Composite resin
 - d. Bioactive zirconium dioxide
 - e. None of the above
7. **Adhesive agents used in the restoration of NCCLs should be:**
 - a. Single-step
 - b. Multistep
 - c. a or b
 - d. Neither a nor b
8. **When restoring NCCLs, mechanical retention should:**
 - a. Never be used
 - b. Consist only of trenches on the occlusal and cervical walls
 - c. Consist of sharp-angled divots created with chisels
 - d. None of the above
9. **A preventive protocol for NCCLs could include:**
 - 1) **Occlusal Adjustment**
 - 2) **Dietary adjustment**
 - 3) **Professional Fluoride therapy**
 - a. 1) only
 - b. 3) only
 - c. 1) and 2) only
 - d. 2) and 3) only
 - e. 1), 2) and 3)
10. **NCCLs can be effectively managed by**
 - a. Preventive measures
 - b. Restorative treatment
 - c. Both a & b
 - d. Neither a nor b

