

Cervical Lesions

Section 7

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Types of Cervical Lesions

- Carious cervical lesions
- Non-carious cervical lesions
 - Mechanically - Abrasion
 - Chemically - Erosion
 - Physically - Abfraction

Cervical Lesions

- GV Black's Cavity Classification Scheme
 - Any lesion or prepared cavity of the gingival third of the facial and lingual surfaces of all teeth are class V cavities.
 - Class V lesions typically present as crescent shaped decalcifications and generally follow the contour of the crest of the gingiva from mesial to distal line angle (Hildebrandt, 2003)

Carious Cervical Lesions

- The etiology of carious cervical lesions (CCLs) is frequent exposure to acid, produced by specific bacteria, which metabolize fermentable carbohydrates in the diet.
- Additional host factors contribute to CCLs such as increased age, low socioeconomic status, calculus, low fluoride exposure, hyposalivation, or environmentally induced xerostomia via medications, or radiation therapy.

Carious Cervical Lesions

- Measures can be instituted to aid in tooth remineralization if the CCLs is arrested in the white spot form. This "white spot" lesion presents with a chalky surface and represents a lesion that is confined to enamel. With continued exposure to risk factors and time, the lesion passes to the dentin-enamel junction and into dentin. At this point the lesion spreads out in a "balloon" fashion and expands rapidly. A carious cervical lesion at this stage exhibits frank cavitation. If cavitation has occurred, the carious lesion must be removed and the tooth operatively restored and endodontics employed if pulpal involvement exists (Hildebrandt, 2003).

Carious Cervical Lesions

- Rampant carious cervical lesions is still common place. These situations are often caused by frequent, large amounts of soda consumption or radiation therapy and medication induced xerostomia.



Non-Carious Cervical Lesions

- Non-carious cervical lesions (NCCLs) vary in appearance, with some displaying shallow depressions, others broad disk-shaped, or large wedge-shaped defects. The floor of the lesion can be flat, indented, or sharply angled (Levitch, 1994).

Non-Carious Cervical Lesions

- At the cervical one third of the tooth, enamel is thinner and not as hard, with the enamo-dentin bond weaker because the junction is smooth and without ridges (Goel, 1991).
- Enamel is irregular and has prisms that are straight and vertical on the CEJ surface, as well as areas of non-prismatic enamel, which thus makes the cervical area more resistant to caries because it is less soluble in acid, which may explain why NCCL occurrence is more common than CCLs in the cervical one third (Jukic, 1999).

Non-Carious Cervical Lesions

- The etiologies of NCCLs are multifactorial, and therefore difficult to categorize into being caused by only abrasion, erosion, or abfraction.
- Although non-carious cervical lesions predominate in the elderly, NCCLs in children can also be seen as white spot lesions on the buccal or lingual surface and most commonly on posterior teeth.
- Cervical lesions typically appear near the gingival crest within the first few years following tooth eruption. Based on clinical experience, it has been found that as the adolescent matures and the gingival crest is relocated apically, the majority of cervical lesions do not progress to cavitation, and the majority of NCCLs occur in the posteriors.

Non-Carious Cervical Lesions

- The prevalence and severity of NCCLs increases with age, and the most frequent location is on the labial side. In the permanent dentition, mandibular premolars had the greatest number of lesions as well as the greatest severity of NCCLs; which were due to abrasion, erosion, and/or abfraction.

Abrasion

- Abrasion NCCLs (also termed toothbrush abrasion lesions or attrition) clinically appear well circumscribed with hard, glassy walls of sclerotic dentin and angular, notch-like or cup-shaped defects. As they progress, abrasion NCCLs deepen and induce gingival recession with resultant root exposure. Unlike root caries, cervical abrasion lesions do not tend to undermine adjacent enamel.
- Although abrasion cervical lesions can become carious, the etiology of the lesion is not related to dental caries and does not require dental caries control strategies. (Hildebrandt, 2003). Not all abrasion lesions are restored due to their proximity to the gingival tissues, and which are healthier next to an un-restored abrasion lesion than next to an optimal composite resin.
- Abrasion lesions will be restored if the lesion jeopardizes the strength of the tooth (the restoration does not strengthen the tooth but prevents further abrasion).

Abrasion



Erosion

- Dental erosion can be defined as "the physical result of a pathologic, chronic, localized loss of dental hard tissue that is chemically etched away from the tooth surface by acid and/or chelation without bacterial involvement" (Huysmans, 2000).
- The critical pH of enamel is 5.5, so essentially any solution with a lower pH that is applied frequently, and for a long duration will cause erosion NCCLs.
- Erosion lesions are not related to dental caries, as the etiology of the two is different. Erosion NCCLs are caused by intrinsic acidic chemicals, either from the stomach in the form of acid reflux disease, regurgitation, or bulimia nervosa, or from the diet such as extrinsic acidic foods like citrus fruits and acidic soft drinks.

Erosion

- Frequent consumption of acidic, diet (sugar free) soda will not cause cervical carious lesions, but can cause cervical erosive lesions (Hildebrandt, 2003).
- Erosion lesions differ from abrasion lesions in that they involve large areas of tooth and are hard, smooth, and poorly demarcated with thin enamel, which has a polished appearance.
- Erosion lesions caused by stomach acids tend to be found on the occlusal surfaces of posterior teeth and the lingual surfaces of all maxillary teeth. If diet is the cause, lesions will remain on buccal surfaces of anterior teeth. Generally, removing the causative agent treats erosion lesions.

Erosion



Abfraction

- Historically abfraction NCCLs were associated with abrasion lesions and thought to be caused by tooth brushing. Both abfraction and abrasion lesions present as well circumscribed with hard, glassy walls of sclerotic dentin and angular, notch-like or cup-shaped defects.
- Abfraction NCCLs today, however, are associated with tooth flexure caused by occlusal loading. Abfraction is thus caused by a large quantity of tensile and compressive stress concentrated in the cervical area, which releases mineral crystals from enamel, and then dentin.

Abfraction

- A small crack in enamel develops and expands into a larger lesion through continued forces concentrated in the area. If a slightly oblique force is applied, the fulcrum will be near the cemento-enamel junction.
- Thus, abfraction cervical lesions are determined by the orientation of occlusal forces and the position of supporting alveolar bone. (Miller, 2003). Abfraction lesions are deeper, narrower and more v-shaped than abrasion lesions.

Abfraction



Etiology of Cervical Lesions

- Carious cervical lesions typically have a unifactorial etiology (bacteria) and non-carious cervical lesions have a multifactorial etiology (abrasion, erosion and abfraction).
- Carious or non-carious cervical lesion etiologies, though, rarely occur alone. This can be attributed to the abundance and complexity of risk factors associated with cervical lesions.
- In order to diagnose and treat these lesions, it is imperative to investigate and assess all relevant risk factors before a determination is made concerning the etiology of the intraoral process that is occurring.

Etiology - Abrasion Lesions

- Abrasion NCCLs, also termed toothbrush abrasion lesions, can become carious, but the etiology of the lesion is not related to dental caries and does not require dental caries control strategies. (Hildebrandt, 2003).
- Subjects with good oral hygiene and those who brushed more than twice a day showed a higher frequency of abrasion lesions. Differing tooth-brushing techniques, however, did not appear to influence the development of the lesions (Sanges, 1976).
- Greater tooth wear was found among men more than women, with no significant variation between subjects of different social class backgrounds (Donachie, 1995).

Etiology - Erosion Lesions

- The etiology of cervical erosion is vast, and an increasing awareness of the prevalence of erosive lesions has led to further studies in etiology and prevention
- Erosion lesions are not related to dental caries, as the etiology of the two is different. Erosion NCCLs are caused by intrinsic acidic chemicals, either from the stomach in the form of acid reflux disease, regurgitation, or bulimia nervosa, or from the diet such as extrinsic acidic foods like citrus fruits and acidic soft drinks.
- Being male, white, and in social deprivation had a significant association to erosion progression (Dugmore, 2003).

Etiology - Abfraction

- An experiment to distinguish abfraction from abrasion lesions found clinical signs of excessive brushing were lacking in the 61 abfraction lesions. Occlusal force disturbances, however, were very consistent with the presence of abfractions with 94.5% of abfractions associated with occlusal wear facets.
- Additionally, in 77.2% of the abfractions there was lack of canine disocclusion. To further disassociate tooth brushing from abfraction lesions, 32.5% of the apical limits of the abfractions are subgingival.

Etiology - Abfraction

- It has been found that the weakening effect of cavity preparation can contribute to the development of abfractions by weakening tooth structure, allowing more cuspal movement under occlusal load to the point that peak tensile and shear stresses in the buccal cervical area were in excess of known enamel stress fracture limits (Rees, 1998).
- Amalgam restorations were found to have a weakening effect on fracture resistance, while composite restorations had an increase in fracture resistance due to the adhesive compressive forces (Schatz, 2001).

Restoring the Cervical Lesion

- The key to restoring the cervical lesion is that each step is conducted in a well isolated area. The soft tissues must be reflected and no saliva or blood must penetrate into the treatment area. Isolation can be achieved by the use of a retraction cord placed in the sulcus to reflect the soft tissues or a retractor clamp such as a 212 or S clamp can be utilized in conjunction with a rubber dam.
- The treatment of a carious cervical lesion involves removing the damaged tooth structure and replacing it with a metallic or nonmetallic filling material. A non-carious cervical lesion in contrast, may be a result not from dental disease but rather poor occlusion or dental compression to an area of the dentition. These lesions can be restored or adjusted by a variety of methods.
- There are five distinct groups typically used as restorative materials for cervical lesions. The first four materials – resin composites, conventional glass ionomers, resin-modified glass ionomers, and compomers – are useful esthetically. The fifth material, amalgam, is regarded as a non-esthetic restorative material.

Restoring the Cervical Lesion

- The use of glass ionomers is used less in anterior regions of the mouth because of its opacity. However, in cases where patients have problems such as xerostomia or have had head and neck radiation, glass ionomers are the material of choice because of the added fluoride leaching benefit.
- In cases where dry mouth is not a concern, composite materials are often the better choice because of their translucent characteristics.

Resin Composites

- Resin composites are defined as a mix of acrylic and submicron glass filler, and are considered the toughest of the esthetic restorations available on the market.
- There is a wide range of resin composites available which vary according to the inert organic filler content. These include microfill, flowable, hybrid, and packable.
- Characteristics of resin composites include:
 1. Microleakage tends to be quite low.
 2. Clinically, this material tends to be moderately resistant to fracture in high-load restorations and moderately resistant to wear.
 3. Composites provide an optimal esthetic result for both carious and non-carious cervical lesions due to the bond provided by dentin adhesive systems.
 4. They are quite useful "when fluoride is not a consideration" (Terry et. al., 2003).

Resin Composites



Conventional Glass Ionomers

- The glass ionomers set via an acid-base reaction and contain a reactive inorganic filler that has the added characteristic of leaching fluoride. This type of material however, is brittle and the weakest of all the types of tooth colored materials with respect to mechanical properties.

Conventional Glass Ionomers

- Advantages include biocompatibility, adhesion to tooth structure, and ability to release, absorb, and re-release fluoride. In addition, little leakage occurs because glass ionomer materials have a coefficient of thermal expansion that is similar to tooth structure, thus, minimal shrinkage occurs with setting (Burgess, 2004).
- Disadvantages of the conventional glass ionomer include the facts that "they are brittle, have poor wear resistance (especially in occlusal load-bearing areas), and are technique-sensitive mainly due to their slow setting reaction" (Burgess, 2004).
- While these materials are indicated for unprepared Class V non-carious cervical lesions and prepared Class V and III lesions in high caries risk patients, they are used less frequently today due to technique sensitivity and the availability of better materials (Terry et. al., 2003).

Conventional Glass Ionomers

- In addition, they can cause "sensitivity to moisture during initial set, lengthy setting time, which requires a second appointment for finishing and polishing, rough surface texture, lack of translucency, and susceptibility to dehydration" (Terry et. al., 2003).

Conventional Glass Ionomers



Resin Modified Glass Ionomers

- RMGIs are hybrids of the conventional glass ionomer in an attempt to improve properties and handling. Resin modified glass ionomer sets by both a polymerization reaction and an acid-base reaction. It too contains fluoride, but it is less brittle and more tough than just the glass ionomer.
- These materials have such positive attributes as fluoride-release, as well as the same recharge capability of the conventional glass ionomer.
- Additional benefits of RMGIs are their higher early strength, improved resistance to fracture, and improved bonding to tooth structure when compared with conventional glass ionomers (Burgess, 2004). They also have the capability of immediate finishing, improved shade matching and translucency, polishability, reduced water sensitivity, and potential for increased wear resistance and retention (Terry et. al., 2003).
- Resin modified glass ionomers are indicated for small, non-load bearing restorations, and as cavity liners and cements for crowns and bridges (Lapinski, 2004).

Compomers

- Compomers are a restorative material that actually blends components of glass ionomer with a resin-based composite.
- This material differs from glass ionomer in that it does not contain water, and mimics resin-based composite in handling and curing properties (Burgess, 2004).
- Compomers are generally considered a weaker resin composite.

Amalgam

- Dental amalgam can generally be described as a mix of silver alloy powder and mercury.
- This material obviously differs from those listed above in that it is generally regarded as non-esthetic since it does not mimic the appearance of the natural dentition.
- This material is advantageous in that it is inexpensive, easy to use, generally well tolerated from a biocompatibility standpoint, and has good strength in large, high-load restorations (Lapinski, 2004).
- The main disadvantage of amalgam is that an amalgam preparation requires removal of a fairly large amount of tooth structure to attain adequate thickness for retention.

Amalgam



Restoring the Cervical Lesion

- When choosing a particular restorative material, it is quite important to consider the needs of the individual patient. As noted by McComb et. al., xerostomic patients can benefit significantly from additional fluoride. However, the type of lesion may also play a role in selection of restorative material.
- Terry et. al. indicates that non-carious abfraction lesions may be caused by defective occlusal contacts. Stress and flexing may cause loss of tooth structure in the cervical area. In this situation, composites with a low modulus of elasticity (e.g., microfill and flowable composite) may be the optimal restorative material.

Restoring the Cervical Lesion

- In addition, situations requiring optimal esthetics (all other factors excluded) can generally be best restored with composite resin based on the general properties of this material. Fine filler sizes, shape, orientation, and concentration create better polishing characteristics in the small-particle hybrid and microhybrid composites (Terry et. al., 2003).
- Metallic restorations such as gold foils and amalgams are more likely to be used in posterior teeth because of esthetic concerns.

Clinical Case

- 37 Year old Caucasian female
- CC: Tooth aches and decayed teeth.
- HPI: Generalized sensitivity to cold.
- PMH: Heart murmur, asthma, smoking, and a prior chemical dependency.

Clinical Case

Prior Chemical Dependency

- Methamphetamine
 - Shaner JW. believes that methamphetamine causes decay by three means:
 - ✦ 1) Xerostomia caused by drug usage.
 - ✦ 2) Increased soda consumption.
 - ✦ 3) Lack of oral hygiene during periods of use.

Pre-Operative



Pre-Operative



Pre-Operative



Pre-Operative



Clinical Cases



Clinical Cases



Clinical Cases



Clinical Cases

