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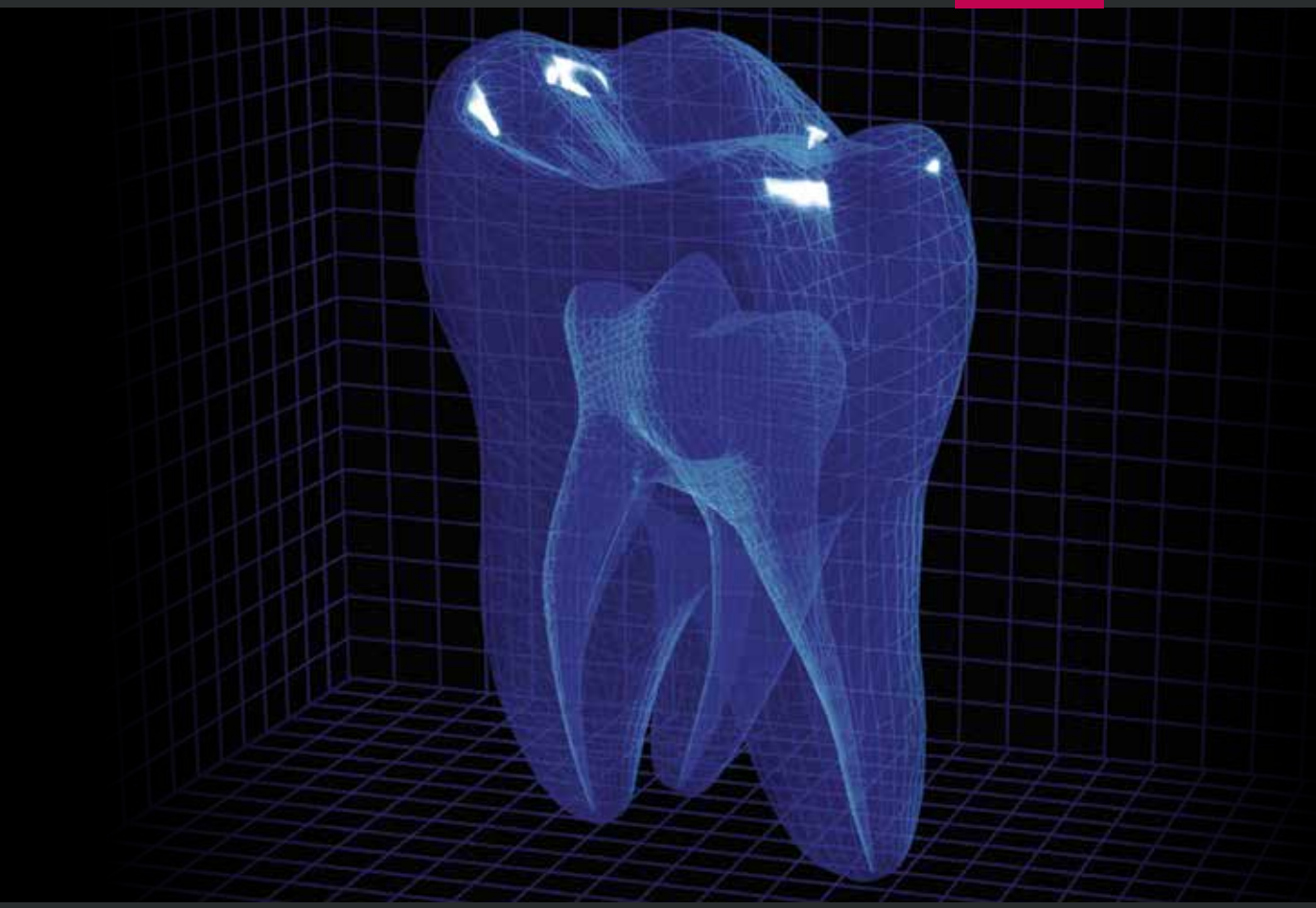

Abfractions: Taking a deep dive into noncarious cervical lesions

A peer-reviewed publication written by Lori Cockley, DDS, MAGD

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Abfractions: Taking a deep dive into noncarious cervical lesions

ABSTRACT

There are processes involved in loss of tooth structure that have nothing to do with bacteria, fracture, infection, or caries. This loss of tooth structure in the cervical area is sometimes termed *noncarious cervical lesion* (*NCCL*) or *abfraction*. Other types of NCCLs include erosion, attrition, and abrasion. It is important to understand the difference in these terms, to recognize that these processes can work synergistically, and to know that etiologies are often multifactorial. The ability to analyze these lesions and identify the causative factors properly is imperative to formulating a proper plan for clinical intervention.

EDUCATIONAL OBJECTIVES

At the end of this self-instructional educational article, the dental professional should be able to:

1. Understand the difference between the various types of noncarious cervical lesions.
2. Cite the general characteristics for abfraction lesions in the general modern adult population.
3. Explore the dental history and the evolution of the understanding of these lesions.
4. List and describe the signs and symptoms of abfraction lesions and the complicating factors.
5. Be able to evaluate and assess these lesions for appropriate clinical intervention.

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FIGURE 1: Example of attrition

FIGURE 2: Example of erosion

FIGURE 3: Example of abrasion

INTRODUCTION TO NONCARIOUS CERVICAL LESIONS

There are processes by which tooth structure is lost that do not include fracture, infection, bacteria or caries. When found at the cervical area, these processes are sometimes referred to as noncarious cervical lesions (NCCLs) and can be separated into the following categories: attrition, erosion, abrasion, and abfraction.

Attrition is defined as the unhealthy loss of tooth structure through long-term heavy tooth-to-tooth contacting forces resulting in the mechanical wearing away of the enamel progressively into the dentin. This is most commonly found at the incisal or occlusal surface (figure 1).

Erosion (sometimes instead referred to as corrosion) is loss of dental hard tissue due to chronic exposure of the enamel and dentin to nonbacterial acids of intrinsic (gastric disorders such as GERD or reflux, chronic vomiting as associated with morning sickness, or eating disorders such as bulimia) and/or extrinsic (acidic food and drink) origin (figure 2).[1] Healthy salivary flow can have a mitigating effect on this process.

Abrasion describes the pathological wearing of dental hard tissue due to an abnormal mechanical process where an outside object acts as the opposing force into the dentin (figure 3). This can occur due to excessive, improper, or overly vigorous tooth brushing; using a hard-bristled toothbrush or an abrasive dentifrice; nail biting; biting a pipe stem; opening bobby pins; holding nails or sewing needles in the teeth; etc.

Abfraction, a term that literally means "breaking away," is used to describe the V-shaped wedges found near the cervical areas of teeth (figure 4). It is theorized to be primarily due to biomechanical loading forces that result in flexure and the ultimate fatigue of enamel and dentin at a location away from the loading. This is thought to be oftentimes associated with chronic bruxing, clenching, or other parafunctional habits. Unlike the other forms of NCCLs, abfraction can be seen in only one tooth and isolated from the rest of the teeth in the arch, which may be unaffected. Abfraction is the least understood and more complex of the NCCL processes.

It's important to clearly differentiate these terms, to recognize that these processes can work synergistically, and to know that their etiologies are often multifactorial. With that in mind, one needs to carefully evaluate each of these similar clinical lesions and construct recommendations for management or clinical intervention. In this literature review, we will primarily explore abfraction lesions.

ABFRACTION: SCIENTIFIC VERSUS THEORETICAL EVIDENCE

The theory of the abfraction process has generally held that when excessive cyclic nonaxial tooth loading lends itself to cuspal flexure that concentrates the stresses in the vulnerable cervical area. The stresses are believed to overcome the bonds between the hydroxyapatite crystals (figure 5), leaving the tooth susceptible to breakdown by a secondary process (abrasion or corrosion).[2]

This addresses the loss of enamel, but may or may not directly hold true for the loss of dentin, which can stand far more tensile stresses.[3] Since occlusal forces during normal function are 40% of maximal bite force, this concept of abfraction might imply that the form of the wedged lesion is a product of stress under severe occlusal parafunction. Bruxism often creates wear facets, but not all teeth with abfractions present with wear facets. It is possible that clenching may also be the parafunction that creates stresses without the attrition necessary for clinical wear facets.

Some variations to this general theory exist. For example, a 2009 Australian study used electron microscope technology to observe the histopathological examples of anterior teeth with these wedge-shaped cervical lesions to determine pathogenesis. Researchers carefully differentiated the teeth with normal versus sclerotic dentin and factored in the patency of the dentinal tubules. They concluded that patency may influence the three-dimensional form of the wedge-shaped lesion. They also concluded that the cervical wedge is shaped by interactions between acid wear, abrasion, and dentinal sclerosis, but found no histopathological evidence of abfraction. They theorized that lesions are a result of multifactorial causes, which would include tooth wear and dentinal repair.[5]

FIGURE 4: Example of abfraction

A study in 2004 observed 18,555 permanent teeth from a population in Croatia. Subjects were divided and classified by age and severity of lesions. Results showed the lower premolars were the most often affected and had the greatest severity. An increase in age was associated with an overall increase in prevalence and severity of lesion. Causal agents were determined to be diverse and interrelated.[6] With age, more bone loss and recession may be present, exposing more root surface and cementum and leaving these areas more vulnerable.[7]

A 2001 study of US veterans evaluated a limited selection of 103 teeth with NCCLs. The study characterized the physical properties and the relationship between tooth brushing techniques to determine if toothbrush abrasion was a factor in the development of these lesions. This study concluded

that toothbrush abrasion was strongly suspected to be a factor in the majority of the teeth evaluated, and that a small subset of lesions were thought to have resulted from some other phenomenon. The contribution of occlusal stresses was not measured directly, so abfraction could not be ruled out in 15% of the cases.[8]

One of the most comprehensive studies that has evaluated a wide variety of clinical components studied a sample of 124 patients aged 15 to 75 years with NCCLs. It addressed medical history, gastric disorders, dietary habits, dental history, and oral hygiene practices. The researchers attempted to analyze the etiology in relation to age and to identify the most important risk factors in the development of cervical lesions. Clinical analysis of tooth wear was performed on each of four surfaces. The distribution and severity of tooth wear was graded with an index that factored in each decade of life. Depth of the cervical lesions were measured, and wear indexes were calculated and compared to predetermined values. These values were set to distinguish between acceptable and unacceptable pathological levels of wear for each decade of life for each tooth surface. Also assessed and analyzed were dentition status, periodontal status, recession, mobility, parafunctional habits, and occlusal contacts. Results showed that tooth loss, including in the cervical region, was related to age because older patients were more likely to present with NCCLs. Frequency, localization, and depth of lesions in this given group of teeth were related to age. Overwhelmingly, the most common area for them to be found was in the premolars (85.1%). A relationship between lateral excursive contacts, bruxism, and the formation of NCCLs were established with respect to hygiene, periodontal condition, and an acidic diet.[9]

Abfracted, wedge-shaped lesions appear to be a modern condition, not found in anthropological samples. Examples include a French study that looked at 259 premodern skulls and did not find one abfraction, and a Chilean pre-Columbian sample of 67 individuals that showed heavy occlusal wear but no abfractions.[10,11] There appears to be no data that exists to support the presence of NCCLs in any animal populations, and neither race nor gender seems to be statistically significant.

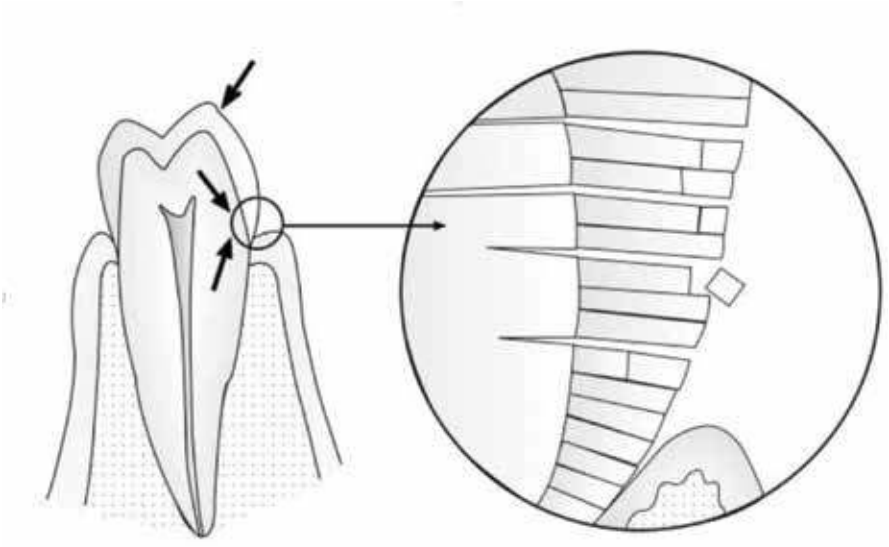

FIGURE 5: Theoretical model of abfraction

THEORIZED EVIDENCE AGAINST ABFRACTION

- Few studies are able to successfully demonstrate the occlusal loading and abfraction relationship.
- Buccal surfaces and lingual surfaces are not equally affected and would seem to be so if flexure was the primary etiology.
- There is little to no evidence in prehistoric skulls found before the invention of toothpowders and toothbrushes.
- Not all persons with parafunction exhibit these lesions, and not all persons with the lesions demonstrate occlusal wear.
- The lesions present at the gingival crest rather than at the osseous crest, where the flexure should be concentrated.
- Some cases show the absence of an antagonist, which disputes the occlusal parafunction theory.[12]

HISTORY AND EARLY THEORIES

"Wasting" was probably the original term for what is now known as abfraction. The first articles describing wasting were in a series of articles by dentist and researcher W. D. Miller, DDS, MD, PhD, ScD, and published in the 1907 January, February, and March issues of *Dental Cosmos* under the title, "Experiments and Observations on the Wasting Tooth Tissue Vicariously Designated as Erosion, Abrasion, Chemical Abrasion, Denudation, etc." It was described as a "Wedge-shaped defect, a wasting away of the tooth at the neck, very often taking a form as though produced by a three-cornered file." Most of Dr. Miller's case studies showed examples of patients who used very high grit dentifrices, such as those containing pumice, cigar ashes, prepared chalk, or powdered oyster shells. He also looked at various toothbrushes as he attempted to research the possible cause for the common condition of wasting. His research found that those who used sodium bicarbonate had the least amount of cervical wedge-shaped abrasion. He evaluated the "action of food and crystalline bodies in the saliva" and found that "no action upon the enamel could be detected." He concluded that brushing with saliva alone caused no appreciable effect other than perhaps a polishing of the surface. He evaluated "mechanical action of the currents of saliva" to see if salivary erosion was a factor, but none was found. His conclusion was that the toothbrush was insignificant to the etiology, but that it was primarily the abrasiveness of the dentifrice. So, if one used a mild tooth powder and perhaps a brush of badger hair, the condition could remain "status quo." Dr. Miller was convinced that wasting was a modern day condition and quoted several cases of the examination of anthropological skulls. He concluded that "not a single case of undisputed wasting could be found."[13]

Dr. Miller practiced in the same era as Greene Vardiman Black, MD, DDS, ScD, LLD, the father of modern dentistry. In his 1914 book *A Work on Operative Dentistry*, Dr. Black looked at Dr. Miller's work and concluded that the erosive wasting was duly a result of "weak acids or gritty toothy powders, or by

both, assisted by the toothbrush." Dr. Black visited Dr. Miller's laboratory and opined that his artificial attempts to reproduce the lesions had not been successful in reproducing the "sharp, clean cut margins so often present in the real thing as it occurs in the mouth." He stated that "a sufficient use of clear water and the brush will, I believe, do no harm." Dr. Black stated that he, himself, in his attempts to study this process, made considerable effort to "reproduce the evil" by placing restorations on the affected cervical areas, but had few successes, as the erosion spread beyond the walls of the restorative material and "[left] the margins of the fillings standing as they were placed." He said that in the majority of cases, he found it was best not to place fillings at all.[14]

In 1950, Samuel Charles Miller concluded in the *Textbook of Periodontia* that "gingival recession is induced on the labial, buccal, and lingual surfaces of teeth by tooth brushing, traumatic occlusion, or by the action of abrasive foods and the tongue, lips, and cheeks during mastication." This was possibly the first connection of occlusal trauma and abfraction.[15] However, in this popular periodontal textbook of the time, brushing technique included these instructions: "[The] bristles should be long and stiff enough so that pressure can be transmitted through them to the gingivae." Synthetic bristles are noted to be "smooth and less efficient at removing debris" and "soften quickly," so "the hair of Chinese and Siberian swine" was recommended as the best material. It was also recommended to always use a thoroughly dried brush and to ideally have three so that they could be hung and allowed to dry for at least 24 hours before using again. It was also suggested to keep the brush in the freezer to stiffen the bristles for better effectiveness. Instructions in the proper technique include the following: "Press bristles at 45 degrees to the long axis of the teeth with enough pressure to blanch the tissues. As soon as the pressure is released from the gingiva, the blanching turns to a bright red due to temporary hyperemia bringing a new supply of blood to the part. This hyperemia is reduced in a short time to a healthy pink color."[15] This very aggressive technique, taught throughout the mid-twentieth century, may have been a contributory component to abfractions.

MODERN THEORIES

The modern term "abfraction" was first proposed in 1991 by Grippo[16] based on work completed by McCoy[17] and Lee and Eakle,[2] who basically described the characteristics of lesions as caused by tensile stresses. They concluded that abfraction lesions were located at the fulcrum of the region of greatest tensile strength concentration. They described them as being wedge-shaped and with a size proportional to the tensile forces applied to them. They acknowledged that local factors such as abrasion or erosion might have an effect on the characteristics.[2]

Grippo introduced the term "abfraction" and defined it by the following: "Due to the stresses resulting from biomechanical loading forces exerted on the teeth (static, as in swallowing and clenching or cyclic, as in chewing), both enamel and dentin can chip or break away. This loss of tooth substance, which shall be termed Abfraction, is dependent on the magnitude, duration, direction, frequency, and location of the forces. These abfractive lesions are caused by flexure and ultimate material fatigue of susceptible teeth at locations away from the point of loading."[16]

Brian Palmer, DDS studied abfractions, and in 2004 documented cases of abfraction and their association with tongue dysfunction. He concluded that swallowing dysfunction and the traumatic lateral forces of tongue thrusting due to ankyloglossia or "tongue-tie" along with premature contacts and traumatic occlusion were the primary contributors to abfraction lesions. He hypothesized that tongue function in an ankyloglossia patient restricted the elevation of the tongue to the palate for a seal during swallowing, and instead caused use of accessory muscles, including the mentalis, creating lateral forces and tooth flexure.[17] He surmised that frenectomies at early ages could have relieved the ankyloglossia which caused the tongue thrust which was the main factor in the development of the malocclusion and the abfractions that followed.[18] He stressed the importance of evaluating tight lingual frenums at birth and understanding the severe consequences of a tongue thrust. Dr. Palmer recommended retraining of the swallowing pattern by a trained oral myofunctional therapist to reduce the lateral forces on the teeth due to tongue thrust and improper rest posture. He also advocated use of equilibration, restorations, and/or occlusal guards to control occlusal parafunction as part of a comprehensive treatment plan in controlling the abfraction process.[19]

Although there is a preponderance of theoretical evidence for abfraction, in fact there is only a small amount of hard experimental evidence[20] and many limitations to those studies reported so far. What has been shown is that cervical tooth structure is more vulnerable to breakdown, but clinical attempts to illustrate this do not well replicate the clinical situation.

COMPETING AND OVERLAPPING THEORIES TO ABFRACTION ETIOLOGY

- Toothbrush and toothpaste mechanical abrasion
- Chemical (acidic) erosion (sometimes referred to as corrosion)
- Tooth flexure due to nonaxial occlusal forces (including parafunctional occlusal forces)
- Tooth flexure due to nonaxial forces from the oral soft tissues (chronic tongue thrusting with associated accessory dysfunctional muscle forces and improper tongue resting posture)

DIAGNOSIS AND CLINICAL EVALUATION

A thorough medical history is the first place to start when a good clinical diagnosis is desired. Any history of eating disorders, gastric regurgitation, or reflux should be explored. A diet that consists of highly acidic foods and drinks, such as excessive consumption of citrus fruits, carbonated drinks, vinegar, chewable Vitamin C tablets and wine, could be very much a factor, so a food diary is useful. The dentist should question the patient about parafunctional occlusal habits, such as bruxing or clenching, or other oral habits such a nail biting or chewing a tobacco pipe or a toothpick. Clinical signs of occlusal problems, such as mobility, open contacts, tipped or drifting teeth, hypereruption, atypical occlusal wear facets, cross bites, deep bites, and open bites, or radiographic signs, such as a widened periodontal ligament, hypercementosis, or resorptions, should be thoroughly evaluated.

These clinical findings may be addressed to help manage and stabilize the process.

CLINICAL INTERVENTION

Clinical management options may be considered if any of the following are observed or reported:

- Tooth sensitivity—Dentinal exposure as a result of the cervical tooth loss could expose the dentinal tubules leading to hypersensitivity.
- Compromised esthetics—The notching of the cervical area could be considered unaesthetic if exposed in the smile or in the aesthetic zone.
- Pulpal damage—Very deep lesions could result in pulpal exposure and abscess.
- Risk of fracture—Cervical tooth loss may be so severe that the crown of the tooth may be at risk for fracturing.
- Caries—Loss of enamel exposes the more caries-prone dentin and creates a lesion where plaque could accumulate, leading to increased risk of caries.
- Periodontal inflammation—The notching and associated accumulations of plaque could irritate the gingiva and cause active inflammation.

Treatment options could include the following:

- Dentinal desensitization
- Restorations with a low elastic modulus that will accommodate flexure, preferably with some element of mechanical retention in the preparation
- Endodontic therapy
- Periodontal therapy
- Equilibration and management of the occlusal interferences
- Frenectomy and elimination of the ankyloglossia
- Oral myofunctional therapy to correct the tongue rest posture and dysfunctional swallowing patterns

Preventive options could include the following:

- Diet counseling—Limiting intake of acidic food and drinks
- Treatment of gastric disorders, including GERD, reflux, and regurgitation
- Application of fluoride—Increase the resistance to caries and decrease sensitivity.
- Counseling—Control body image disorders, such as anorexia or bulimia.
- Occlusal guards—Prevent and control nocturnal parafunctions, such as bruxing and clenching.
- Correct the parafunctional habits—Nail biting, pencil chewing, toothpick chewing, etc.
- Correct the resting tongue posture and dysfunctional swallow habits.

The wedge-shaped, cervical lesions commonly known as abfractions are seen nearly every day in a modern clinical dental practice. Although identified early in dental literature, much is still not fully understood. Although the etiology of these lesions appears complex and multifactorial, a good clinical assessment, including the documentation of all relevant signs and symptoms, can help clinicians determine the appropriate management.

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QUESTIONS

1. The processes involved in nonccarious tooth loss are:

A. Multiples of ten
B. Multiphasic
C. Multifactorial
D. Multifaceted

2. Tooth structure may be lost by which of the following?

A. Fracture
B. Infection
C. Bacteria
D. All of the above

3. Which of the following process involves the wearing away of tooth structure due to heavy tooth to tooth contact?

A. Attrition
B. Erosion
C. Abrasion
D. Abfraction

4. Which of the following processes involves the loss of tooth structure by the chronic exposure to intrinsic or extrinsic acids?

A. Attrition
B. Erosion
C. Abrasion
D. Abfraction

5. Which describes the pathogenic wearing of tooth structure due to the mechanical process of an outside object wearing on the tooth?

A. Attrition
B. Erosion
C. Abrasion
D. Abfraction

6. What is a term that literally means "breaking away"?

A. Attrition
B. Erosion
C. Abrasion
D. Abfraction

7. What term is commonly used to refer to the wedge-shaped lesions found at the cervical area of the tooth?

A. Abfraction
B. Adirondack
C. Abby normal
D. Appendectomy

8. The generally accepted theory of abfraction involves excessive nonaxial loading forces that lead to cuspal flexure that concentrates stresses in what vulnerable area?

A. Cervical
B. Cylindrical
C. Cyclorama
D. Cervix

9. Abfraction is oftentimes associated with which of the following?

A. Clenching
B. Bruxing
C. Other parafunctional habits
D. All of the above

10. The stresses of parafunctional forces are theorized to overcome the bonds between the

A. Enamel and cementum
B. Hydroxyapatite crystals
C. Enamel rods
D. Periodontal ligaments

11. Which of the following statements is false?

A. Bruxism can create wear facets.
B. All teeth with wear facets also present with abfraction.
C. Clenching may be associated with abfraction.
D. Normal functional occlusal forces are a fraction of maximal force.

12. A modern study of wedge-shaped lesions used electron microscopy and concluded that the cervical wedge is shaped by:

A. Acid wear
B. Abrasion
C. Dentinal Sclerosis
D. All of the above

13. With an increase in age, which of the following clinical findings are more common and may leave the cervical areas vulnerable?

A. Increased bone loss
B. Increased recession
C. More exposed root surfaces
D. All of the above

14. Which tooth is statistically the most likely to exhibit wedge-shaped cervical lesions?

A. Central incisors
B. Third molars
C. Premolars
D. Canines

15. What was probably the original term for what is now known as "abfraction"?

A. Whittling
B. Wasting
C. Dwindling
D. Whatchamacallit

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QUESTIONS

16. Early clinical journals described wedge-shaped clinical lesions with which of the following terms?

A. "Wedge-shaped defect"
B. "A wasting of the tooth at the neck"
C. "Taking the form as though produced by a three-cornered file"
D. All of the above

17. Dr. G. V. Black, the father of modern dentistry, first described these wedge-shaped lesions as:

A. Erosive Wasting
B. A result of weak acids or gritty toothpowders
C. Assisted by the toothbrush
D. All of the above

18. Dr. G. V. Black concluded that

A. The lesions were unable to be successfully reproduced in the laboratory.
B. Clear water and a brush would do no harm.
C. It was best, in many instances, not to restore these lesions.
D. All of the above

19. In the mid-twentieth century, it was recommended by periodontal textbooks of the day that:

A. Toothbrush bristles should be allowed to thoroughly dry between uses.
B. A significant amount of pressure should be applied during brushing the teeth and gums.
C. Synthetic bristled brushes were too smooth and ineffective. Natural boar hair was preferred.
D. All of the above

20. The very first person to propose the phrase "abfraction" was

A. J. O. Grippo
B. G. V. Black
C. Gordon Christensen
D. None of the above

21. Dr. Brian Palmer's research was the first to discuss what condition as it relates to abfraction lesions?

A. Tongue thrust
B. Tongue-tie
C. Resting tongue posture
D. All of the above

22. A thorough medical history should include questions about

A. Dietary habits
B. History of eating disorders and reflux
C. Parafunctional habits
D. All of the above

23. Clinical signs of occlusal problems could include:

A. Wear facets
B. Open contacts
C. Drifting and tipping teeth
D. All of the above

24. Which of the following is not a clinical sign of a possible occlusal problem?

A. Widened PDL
B. Mobility
C. Fluorosis
D. Deep or open bite

25. Which of the following is a possible cause for dental hypersensitivity?

A. Exposed dentinal tubules as a result of cervical tooth loss
B. Brushing and flossing regularly
C. Wearing a well-made occlusal guard
D. Genetics

26. What is the preferred type of restorative material for abfraction lesions?

A. Gold foil
B. Porcelain crown
C. Resin with a low elastic modulus that will accommodate flexure
D. Veneers

27. What clinical conditions might cause consideration of clinical management of abfraction lesions?

A. Compromised esthetics
B. Caries
C. Periodontal inflammation as a result of accumulations of plaque
D. All of the above

28. Abfraction treatment options might include which of the following

A. Restorations
B. Endodontic therapy
C. Frenectomy and elimination of ankyloglossia and associated tongue thrust
D. All of the above

29. Preventive options might include which of the following?

A. Diet counseling
B. Application of fluoride
C. Occlusal guards
D. All of the above

30. Which of the following treatment options would not be useful in treating abfraction lesions?

A. Dentinal desensitization
B. Oral myofunctional therapy to correct the swallowing dysfunction
C. Recommending a hard-bristled toothbrush
D. Periodontal therapy

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ANSWER SHEET

Abfractions: Taking a deep dive into noncarious cervical lesions

Name: Title: Specialty:

Address: Email: AGD member ID (if applies):

City: State: ZIP: Country:

Telephone: Primary ( ) Office ( ) License renewal date:

Requirements for obtaining CE credits by mail/fax: 1) Read entire course. 2) Complete info above. 3) Complete test by marking one answer per question. 4) Complete course evaluation. 5) Complete credit card info or write check payable to Endeavor Business Media. 6) Mail/fax this page to DACE. A score of 70% is required for CE credit. **For questions, call (800) 633-1681. Course may also be completed at dentalacademyofce.com.**

EDUCATIONAL OBJECTIVES

1. Understand the difference between the various types of noncarious cervical lesions.
2. Cite the general characteristics for abfraction lesions in the general modern adult population.
3. Explore the dental history and the evolution of the understanding of these lesions.
4. List and describe the signs and symptoms of abfraction lesions and the complicating factors.
5. Be able to evaluate and assess these lesions for appropriate clinical intervention.

COURSE EVALUATION

1. Were the individual course objectives met?

Objective #1: Yes No Objective #2: Yes No

Objective #3: Yes No Objective #4: Yes No

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

2. To what extent were the course objectives accomplished overall?	5	4	3	2	1	0
3. Please rate your personal mastery of the course objectives.	5	4	3	2	1	0
4. How would you rate the objectives and educational methods?	5	4	3	2	1	0
5. How do you rate the author's grasp of the topic?	5	4	3	2	1	0
6. Please rate the instructor's effectiveness.	5	4	3	2	1	0
7. Was the overall administration of the course effective?	5	4	3	2	1	0
8. Please rate the usefulness and clinical applicability of this course.	5	4	3	2	1	0
9. Please rate the usefulness of the supplemental webliography.	5	4	3	2	1	0

10. Do you feel that the references were adequate? Yes No

11. Would you participate in a similar program on a different topic? Yes No

12. If any of the continuing education questions were unclear or ambiguous, please list them.

_____

13. Was there any subject matter you found confusing? Please describe.

_____

14. How long did it take you to complete this course?

_____

15. What additional continuing dental education topics would you like to see?

_____

Mail/fax completed answer sheet to:

Endeavor Business Media
Attn: Dental division
1421 S. Sheridan Rd.; Tulsa, OK 74112
Fax: (918) 212-9037

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5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	20.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	21.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	22.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	23.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	24.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	25.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	26.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	27.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
13.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	28.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
14.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	29.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
15.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	30.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

AGD code: 739

PLEASE PHOTOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.

INSTRUCTIONS

All questions have only one answer. Grading of this examination is done manually. Participants will receive confirmation of passing by receipt of a verification form. Verification of Participation forms will be mailed within two weeks after taking an examination.

COURSE EVALUATION AND FEEDBACK

We encourage participant feedback. Complete the survey above and e-mail feedback to Aileen Gunter (agunter@endeavorb2b.com) and Laura Winfield (lwinfield@endeavorb2b.com).

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