Periodontal Screening: Patient Attitudes and Clinical Care Decision Making

Student Researchers

Shefali Bhatt, RDH, BS

Catherine D. Garrison, RDH, BS

Yvette N. Johnson, RDH, BS

Sneha G. Patel, RDH, BS

ABSTRACT

Background: There is a common understanding in the scientific community about the key factors involved in the development and advancement of periodontal disease. Oral health care providers have relied on patient symptoms and clinical manifestations when attempting to identify and diagnose periodontal disease. The purpose of this study was to determine if microbiological testing and education would change patient attitudes and beliefs toward periodontal screening.

Methods: A convenience sample of 15 individuals completed a pre-experimental survey and submitted plaque samples for the benzoyl-DL-arginine-naphthylamide test. Patients then received test results and education. Thirty Southern California based RDHs participated in an online survey to determine their awareness and use of these tests in private practice.

Results: Of the 15 patients surveyed, the pre-BANA-enzyme survey results indicated that 46.7% (n=7) of the patients believed they had low susceptibility to periodontal disease. The second post-BANA-enzyme test survey showed that 60% (n=9) preferred a comprehensive periodontal evaluation and 40% (n=6) of patients preferred a "cleaning."

Conclusion: Providing laboratory-confirmed risk assessment test results and periodontal disease education provided a 46.7% increase in patients who preferred a comprehensive periodontal examination rather than a cleaning.

Introduction

Periodontal disease may be more prevalent in the United States than previously believed. On September 21, 2010 the American Academy of Periodontology (AAP), in conjunction with the Centers for Disease Control and Prevention (CDC), issued a statement indicating that previous studies of periodontal disease in the U.S. may have underestimated disease prevalence by as much as 50%.[1] This is an important realization for dentistry, as well as the general population, because periodontal disease has been linked to heart disease, rheumatoid arthritis, diabetes, and other chronic inflammatory diseases.

Presently, there is a common understanding in the scientific community about the key factors involved in the development and advancement of periodontal disease. While the exact mechanism of periodontal disease occurrence and progression continues to be a topic of intense research, it is currently understood that a complex interrelation between pathogenic bacteria and the host-response system exists.

Historically, oral health care providers have relied on patient symptoms and clinical manifestations when attempting to identify and diagnose periodontal disease. Currently, most methods of assessment merely evaluate the destruction of past disease processes. Clinicians do not know the exact makeup of the microflora in a patient's mouth and are unaware of exactly how a patient's host-response system may be influencing disease occurrence and progression. Qualitative and quantitative testing to assess the species diversity and abundance of bacteria present in the oral cavity is available. Furthermore, technology is now available to assess if an individual has a genotype that predisposes

them to an overproduction of interleukin-1, a cytokine associated with inflammation and tissue destruction in periodontal disease. While these advanced methods are available to aid in effective treatment, they are frequently reserved for cases of aggressive periodontitis or utilized only once conventional therapy has failed.

LEARNING OBJECTIVES

Upon completion of this course, the dental professional should be able to:

1. Discuss the role of microbiological testing and education on patient attitudes towards periodontal risk assessment.
2. Describe the key bacteria associated with periodontal disease states
3. Describe the various methods and tools available for periodontal screening
4. Describe the significance of periodontal health as it relates to total health

Key Bacteria Associated With Gingivitis and Periodontitis

According to the American Academy of Periodontology (AAP), "gingivitis is the mildest form of periodontal disease."[2] Gingivitis causes increased vascularity and edema of the gingival tissues, thus creating a pseudopocket. As the disease process continues, there is a microbial shift from gram-positive to gram-negative bacteria, cocci to rods, non-motile to motile bacteria, saccharolytic to asaccharolytic bacteria, and facultative anaerobes to obligate anaerobes.[3] Gingivitis is most often correlated with high levels of gram-positive facultative cocci such as *Streptococcus mitis* and *Streptococcus sanguis*, and the gram-negative obligate anaerobic rod *Fusobacteriumnucleatum*. If gingivitis goes untreated, it can progress to periodontal disease.

Pathogenic bacteria, which contribute to periodontal disease, have been extensively researched. While periodontal disease is considered to be a multi-factorial disease, a number of key bacteria have been found to play a substantial role in the disease progression. The bacteria most often investigated in regards to periodontal disease are: *Aggregatibacter actinomycetemcomitans; Porphyromonas gingivalis; Treponema denticola;* and *Tannerella forsythensis*.[4-6] These bacteria, along with various other bacterial strains, have a role in tissue and bone destruction of periodontal disease. Chronic periodontitis is frequently associated with gram-negative obligate anaerobic rods, including *Porphyromonas gingivalis, Tanerella forsythensis,* and *Prevotella intermedia*. Aggressive periodontitis is most often affiliated with the gram-negative facultative rod *Aggregatibacter actinomycetemcomitans.*[3,6]

Both chronic and aggressive periodontal diseases exhibit no definitive differences between the measures of host response or etiology of each type.[7] However, the bacteria that are unequivocally related to the progression of periodontal disease are known as "red complex" bacteria and include *P. gingivalis*, *T. denticola*, and *T. forsythensis*. Strong interest in further understanding the species-specific involvement in the progression of periodontal disease has been fueled by the advent of current diagnostic technologies.[5]

Genetic Disposition to Periodontal Disease

Periodontal disease arises from a complex interplay between specific pathogenic bacteria and the host-response system. Apart from environmental or modifiable factors, studies have shown that individuals with a family history of periodontal disease are more prone to developing the disease themselves. Moreover, research shows there are certain genetic components that influence the host-response system.[5,8] As such, the ability to resolve gingivitis and periodontal disease is related to genetic factors and the ability to heal is directly related to the strength of the immune system. Therefore, individuals who have a weakened immune system often have a difficult time recovering from conditions such as periodontal disease.

Individuals who have the combination of interleukin (IL)-1 allele 2 at IL-1A and IL-1B are considered to be genotype positive and are susceptible to increased periodontal tissue destruction.[9] In the case of aggressive periodontitis, there appears to be a hyper-responsive macrophage phenotype, which also includes elevated levels of IL-1 and prostaglandin E2 (PGE2).[10] Both the likelihood of being afflicted with periodontal disease and the ability to heal from tissue destruction are associated with genetic factors.[5,8,11] The weight of evidence clearly indicates a need for genetic consideration when screening as well as treating periodontal disease.

Periodontal Screening and Microbial Testing

Currently, the Periodontal Screening and Recording (PSR) index is one of the most commonly utilized methods for periodontal screening. The PSR method, introduced in 1993, is a modification of the Community Periodontal Index of Treatment Needs (CPITN).[12] The PSR index divides the mouth into sextants and the greatest probe depth in each sextant of the mouth is determined and recorded. The scoring for the PSR index is based on a scale of 0 to 4. A score of 0 shows that the deepest probing depth in the sextant is less than 3.5mm with no bleeding on probing or calculus identified. A score of 1 follows the same

Continued on Page 8

guidelines as a score of 0 however, bleeding is present. A score of 2 indicates that there is supragingival calculus, subgingival calculus, or defective margins present in the sextant. A score of 3 is assigned when the highest probing depth in the sextant is between 3.5 mm and 5.5mm. A score of 4 signifies that the highest probing depth is higher than 5.5mm. Sextants which have less than two teeth are scored with "X" and are not included in the overall evaluation. Scores with an asterisk (*) next to them indicate conditions such as mobility, furcation involvement, and mucogingival defects. It is noted that the PSR method does not take into account factors such as radiographic evidence, clinical attachment level, and gingival assessment.[13-15]

In general, treatment of gingivitis and periodontitis is most often based on clinical manifestations of the disease. Primary treatment is usually centered on mechanical debridement, regardless of the types of oral microflora that may be present. Of these pathogenic bacteria, *A. actinomycetemcomitans* and *P. gingivalis* are especially difficult to remove through mechanical debridement.[16,17]

Various microbial testing methods, such as culture methods, immunological methods, nucleic acid probe methods, and polymerase chain reaction (PCR) methods, are currently available to help test for specific pathogens and their prevalence in the oral cavity. Of the microbial testing methods currently employed in the dental field, bacterial cultures are the main technique used and are often the standard to which other microbial tests are compared against.[16,18] The application of microbial testing is generally reserved for cases of periodontitis in which conventional therapy has failed. Microbial testing is utilized in aggressive periodontitis, refractory periodontitis, recurrent periodontitis, or when antibiotics need to be prescribed.[16-18]

Aggressive Periodontitis – A form of rapidly progressing periodontal disease (generalized or localized) that exhibits attachment loss and bone destruction in otherwise healthy individuals with a familial aggregation to the disease.

Refractory Periodontitis – A destructive form of periodontal disease that continues to exhibit attachment loss at one or more sites after efforts by the patient and clinician have been executed to control the disease.

Recurrent Periodontitis – Periodontal disease that exhibits signs and symptoms of destructive periodontitis that reappear after successful periodontal therapy is rendered.

Although most literature usually discusses the use of microbial tests after other types of therapy have shown to be ineffective (i.e. refractory periodontitis), there is also discussion of employing its use in detecting the presence and proportions of specific pathogens prior to treatment or concurrently with treatment.[16-19] The use of microbial tests prior to treatment or as an adjunct to treatment can aid in the prevention of unnecessary and often ineffective treatment.

Systemic Health Implications from Periodontal Disease

Technological advances marking this decade, open an area in oral health care that had until recently been theoretical and controversial. These advances illuminate the association between oral and systemic health.[20-22] This association has been observed in cases involving periodontal disease. The types and numbers of bacteria harbored in the oral cavity are constantly fluctuating. This delicate balance of bacteria can provide both protective and functionary purposes or when disturbed, can potentiate a destructive effect. The proliferation of bacteria found in the oral cavity can be dispersed throughout the body, as seen in the study conducted by Nakano and colleagues.[21] This study identified bacterial strains of *Streptococcus mutans* and *Aggregatibacter Actinomycetmcomitans*, natives to the periodontally involved oral cavity. This oral-systemic association is not solely predicated on the effects of oral bacteria dispersed systemically, but recent literature has shown a two-way relationship between systemic disease and oral health.[20,22] In an observational study conducted in 2008,[22] the adverse effects of diabetes established detrimental effects on periodontal health. Although an association between oral and systemic health has been shown, the extent and severity of this two-way relationship needs to be further studied to gain irrevocable validity in the field.[20,22]

The purpose of this study was twofold: firstly, to determine if utilizing laboratory tests and patient education would have an effect on patient attitudes toward early, pre-disease periodontal screening; secondly, in line with patient education, the researchers wanted to determine if microbial testing is currently used as a diagnostic measure in periodontal disease diagnosis. This project utilized a BANA-enzyme test to detect pathogens in the oral environments of patients. The utility and limitations of a BANA-enzyme test were well documented by Loesche and colleagues in 1992.[23]

The research studies conducted by Loesche and colleagues indicated that periodontal pockets that tested BANA-positive consistently had higher spirochete numbers compared to BANA-negative pockets. Those sites, which continued to test BANA-positive after scaling and root planning, experienced more attachment loss the rest of the year compared to the

Table IA: Demographics		
Patients (n=15)	**n**	**%**
Age		
20-24	2	13.3
25-29	3	20.0
30-34	3	20.0
35-39	2	13.3
40+	5	33.3
Gender		
Male	7	46.7
Female	8	53.3
Ethnicity		
Caucasian	3	20.0
African American	1	6.7
Asian	6	40.0
Hispanic	1	6.7
Multi-racial	0	0.0
Other	4	26.7
Survey 1: Susceptibility to Periodontal Disease		
Highly susceptible	1	6.7
Susceptible	0	0.0
Moderately susceptible	5	33.3
Low susceptibility	7	46.7
Not susceptible at all	2	13.3
Survey 1: Treatment Preference		
Periodontal Evaluation	2	13.3
Cleaning	13	86.7
Survey 2: Susceptibility to Periodontal Disease		
Highly susceptible	1	6.7
Susceptible	2	13.3
Moderately susceptible	3	20.0
Low susceptibility	9	60.0
Not susceptible at all	0	0.0
Survey 2: Treatment Preference		
Periodontal Evaluation	9	60
Cleaning	6	40

Table IB: Demographics		
Registered Dental Hygienists (n=30)	**n**	**%**
Age		
20-24	1	3.3
25-29	2	6.7
30-34	4	13.3
35-39	4	13.3
40+	19	63.3
Gender		
Male	1	3.3
Female	29	96.7
Years Practicing		
0-4	6	20.0
5-9	1	3.3
10-14	8	26.7
15-19	1	3.3
20+	14	46.7
Other	4	26.7
Specialty of Practice		
Pediatric	0	0
General	27	90.0
Periodontal	3	10.0
Orthodontic	0	0
Familiarity with Tests		
PSR System	25	92.6
BANA Enzymatic	4	14.8
Oral DNA	13	48.1
GCF Assay	10	37.0
DNA Probe Assay	12	44.4
Reason for Not Testing		
Cost	2	11.1
Time	2	11.1
Availability	7	38.9
Patient/Doctor Acceptance	8	44.4
Reason for Not Testing		
Screening	7	28.0
Therapeutic Endpoints	8	32.0
Diagnosis/Treatment	20	80.0
Baseline	2	8.0
Differential Diagnosis	5	20.0

Table IIA:BANA-enzyme Test Negative Patient Results

	Before BANA		After BANA	
Patients	PS	TP	PS	TP
A	L	CI	M	PE
B	L	CI	L	PE
C	L	CI	L	CI
E	M	PE	L	PE
H	L	CI	L	CI
J	H	PE	S	PE
K	N	CI	L	PE
L	M	CI	L	CI
M	L	CI	L	CI
N	M	CI	H	CI

PS = Perceived Susceptibility
N = none; L = low; M = moderate;
S = susceptible; H = highly susceptible

TP = TreatmentPreference
CI = cleaning; PE = periodontal examination

Patients E, J, L lowered their perceived susceptibility following a negative BANA-enzyme test. Counter to our expectations patients A, B, K elevated their treatment preference following the BANA-enzyme test.

Table IIB:BANA-enzyme Test Positive Patient Results

	Before BANA		After BANA	
Patients	PS	TP	PS	TP
D	M	CI	M	PE
F	L	CI	M	PE
G	N	CI	L	PE
I	L	CI	L	PE
O	M	CI	S	CI

PS = Perceived Susceptibility
N = none; L = low; M = moderate;
S = susceptible; H = highly susceptible

TP = TreatmentPreference
CI = cleaning; PE = periodontal examination

Patients F, G, O raised their perceived susceptibility following a positive BANA-enzyme test. In-line with our expectations patients D, F, G, I elevated their treatment preference following the BANA-enzyme test.

Continued on Page 10

BANA-negative sites. Because of this, BANA-enzyme test results may be useful as predictor for future attachment loss. However, an important limitation of the type of BANA-enzyme test used in the Loesche study is that it is difficult to administer chairside. With the time constraints of a dental office, a modified version of this type of diagnostic test would be more plausible.

METHODS AND MATERIALS

This study involved two populations. Patients consisted of 15 randomly selected individuals from the local community; and the RDH population included 30 local clinicians and educators.

Patient Survey and Microbial Testing

The patient population was given a survey to determine perceived susceptibility to periodontal disease and whether they would prefer a "cleaning" or a periodontal evaluation. After taking the survey, patients then took a BANA-enzyme test. Subgingival samples of biofilm were obtained from the four most inflamed areas in the dentition. The samples were placed on a BANA-enzyme test strip and incubated for 5 minutes at 55° Celsius to determine the presence of *P. gingivalis, T. denticola,* or *T. forsythensis* in the oral cavity. After the results were evaluated, each patient was briefly educated about the significance of specific pathogens and periodontal disease, and was presented with the results of their BANA-enzyme tests. Patients were then given a second survey to determine how the knowledge of their results affected their attitudes and beliefs toward a comprehensive periodontal examination.

Culturing Microbial Plaque

The samples obtained from each patient were placed in a nutrient broth and incubated at 37° Celsius for one day. Using the spread plate technique, 0.1mL of each suspension was placed on Tryptic Soy Agar plates and incubated for two days at 37° Celsius. After the two days, the Colony Forming Units (CFUs) from each plate were calculated.

RDH Survey

Microbiological diagnostic testing is traditionally completed prior to treatment to determine the virulent strains affecting the patient's periodontal status. To examine current understanding and utilization of microbiological testing in private practice, a third survey was distributed to 30 RDHs. The survey included the following questions: number of years in practice; knowledge about existing periodontal screening options; if they applied these methods in a clinical setting; and reasons why they did or did not utilize these methods. These various testing methods as seen in the dental office included: immunoassays; enzymatic assays; nucleic acid probes; and PCR assays, which serve in a diagnostic capacity.[24]

RESULTS

Data Analysis

Patient data analysis was accomplished by comparing initial pre-BANA-enzyme preferences with post-BANA-enzyme preferences to see how many patients shifted their answer from wanting a "cleaning" to how many patients now preferred a comprehensive periodontal evaluation. The data collected from the RDH surveys were compiled to compare current awareness of microbial testing and factors that may influence utilization of these tests in a clinical setting.

Patient Surveys

The second survey (n=15) showed that 60% of patients (n=9) believed they had low susceptibility to periodontal disease. Only 13.3% (n=2) of the patients believed they were susceptible and 6.7% (n=1) thought they were highly susceptible to periodontal disease (Table IA). Of the patients surveyed, 86.7% (n=13) preferred a "cleaning" and 13.3% (n=1) patients preferred a comprehensive periodontal evaluation.

The results of the BANA-enzyme test (Table II) revealed 33% (n=5) patients tested positive and 66% (n=10) patients tested negative. The second post-BANA-enzyme test survey showed that 60% (n=9) now preferred a comprehensive periodontal evaluation and 40% (n=6) of the patients preferred a "cleaning." In particular, 80% (n=4) of the BANA-enzyme positive patients and 30% (n=3) of the BANA-enzyme negative patients changed their preference from prophylaxis to periodontal examination. The results of the CFU count (Table II) showed no correlation between a high number of bacteria and a positive BANA-enzyme test result, nor did it show the opposite correlation between a low number of bacteria and a negative BANA-enzyme test result.

The two main microbiologic testing methods that RDHs were familiar with were the PSR method and BANA enzyme tests (Table IB). The key reasons for not utilizing microbiologic testing in the dental office included availability of the testing methods and doctor or patient acceptance. For the RDHs who stated that they used microbiologic testing, one of the main reasons for utilization was for diagnosis and treatment determination (Table IB).

DISCUSSION

Our findings from the patient surveys indicate that there were noticeable changes in perceptions of susceptibility toward periodontal disease and preferences toward early periodontal screening. These changes were true both in the BANA-enzyme negative as well as the BANA-enzyme positive groups. In the case of the BANA negative group, it was expected that perceptions of susceptibility would be lowered, which was the finding in several of these patients. Likewise in the BANA positive group, it was expected that perceptions of susceptibility would be raised and this finding was present in several of these patients.

In addition to the surveys, our study included bacteria culturing. After two days of growth in an anaerobic environment, we counted Colony Forming Units (CFUs). While the CFUs had no correlation with the positive or negative BANA-enzyme results, this test served as an important reminder that although the amount and type of bacteria are important factors in periodontal disease, other factors such as genetic disposition and host response are also important to disease development. These findings are in line with earlier reports that CFUs are not the main factors contributing to the progression of periodontal disease.[23]

While the majority of the RDHs surveyed were familiar with several of the microbial tests currently available in clinical practice, the reasons why these test are not utilized in the dental office could not be fully understood from the findings of the survey. Many respondents to the professional survey cited availability and acceptance as top reasons for not using the microbial technologies. Perhaps the rationale for infrequent use of such tests in the clinical setting is based on the belief that oral diseases in general are treatable and not usually life threatening and oral diseases have little relationship to other aspects of health with only a minor importance in the greater social and economic context.[25]

A limitation of the BANA-enzyme test is that although many spirochetes may be present in plaque biofilm, T. denticola appears to be the only spirochete that is able to produce a positive result on the BANA-enzyme test.[26] Therefore, a biofilm sample containing a low number of T. denticola but high number of spirochetes may still yield a negative result on BANA-enzyme test. The BANA-enzyme test could possibly result in a false positive due to plaque samples being contaminated with proteolytic enzymes from blood and gingival crevicular fluid (GCF) that could potentially hydrolyze BANA enzyme. Nonetheless, a sufficient amount of blood or GCF must be present in order to create the prospect of a false positive.[26]

Furthermore, the BANA-enzyme test is technique-sensitive. Adequate samples of biofilm, proper placement of samples on test strips, and proper incubation are all factors that may influence the results of the test. Other technologies, such as DNA probes and immunological reagents, have also shown accuracy in the detection of T. denticola, P. gingivalis, T. forsythensis, and A. actinomycetemcomitans in subgingival samples.[27] However with these types of testing methods, patient samples often have to be sent to a laboratory for analysis. The benefit of the BANA-enzyme test is that it may be performed chairside and results can be obtained within minutes.

CONCLUSION

Patient education, with the aid of microbial testing, directly influences patient acceptance of early comprehensive periodontal evaluation. Results of the clinician survey indicated the majority of RDHs were familiar with several of the microbiological and genetic testing methods listed. Yet the top reasons for why these methods were underutilized included lack of availability and doctor or patient acceptance. Based on the results of the patient survey and enzyme experiments, patient acceptance increased once patients were provided with lab test results and patient education.

Patient education is often viewed as a time constraint in private practice. Our experiment results yielded a 46.7% increase in desire for comprehensive periodontal evaluation after receiving lab test results and education. This study demonstrates that in less than two minutes, with a simple and direct explanation, a patient can realize the value of a comprehensive periodontal examination with the aid of a chair side lab test.

ACKNOWLEDGMENTS

The authors thank Wendy St. Cyr for her continuous assistance, motivation, and dedication to the success of this project.

BANA test strip photograph courtesy of the OraTec Corporation, Manassas,VA.www.oratec.net

References on page 39

About the Authors:

Shefali Bhatt has recently graduated from West Coast University's bachelor program in dental hygiene and is currently working part time as a registered dental hygienist with plans on pursuing her Masters degree in education. She is the mother of two boys.

Continued on Page 12

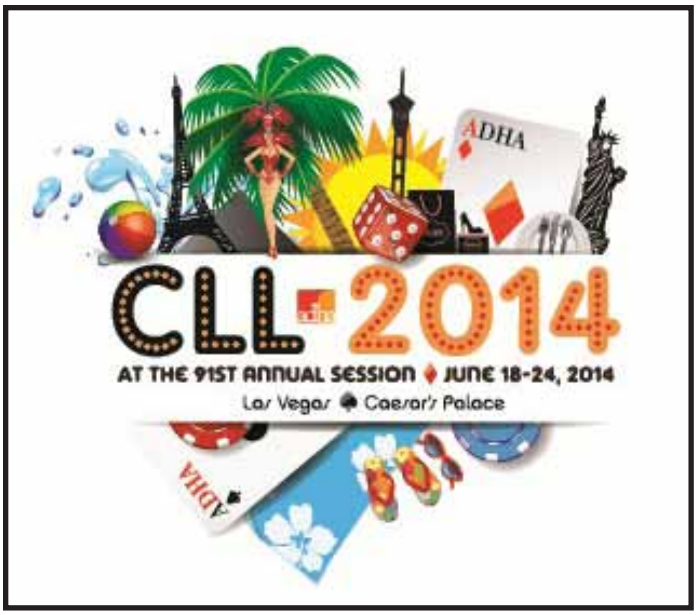
Catherine D. Garrison, RDH, BS is currently practicing dental hygiene in private practice in Southern California. She graduated from West Coast University in 2013, and is a proud member of both ADHA and the Orange County dental hygiene component.

Yvette N. Johnson, RDH, BS is a 2013 graduate of West Coast University and a Dean's list honoree. She also holds a degree in Political Science from the University of California, Riverside, CA.

Sneha Patel completed her undergraduate studies at the University of California San Diego. She then received her bachelors in Dental Hygiene with honors from West Coast University. She currently works clinical dental hygiene in Del Mar and Solana Beach, CA. She is a proud member of Sigma Phi Alpha and also serves as the editor for the San Diego Dental Hygienists' Society.

Faculty Mentors:

Aubreé M. Chismark, RDH, MS is an Assistant Professor in the Dental Hygiene Department at West Coast University in Anaheim, CA, as well as a registered yoga teacher with the Yoga Alliance. She is a member of the CDHA Journal Advisory Board. Her research interests include ergonomics and the use of Complementary and Alternative Medicine to reduce chronic musculoskeletal pain. She can be contacted at: achismark@westcoastuniversity.edu.



Marlena M. Shore, RDHAP, BS is a member of the faculty at West Coast University and Cerritos College. She is currently enrolled at Loma Linda University pursuing her Master's degree in Health Professions Education. Marlena is a proud of CDHA and currently served as the co-chair for the CDHA Student Relations Council and is the student liaison with the South Bay Component.

Benjamin Tran, MSc, is an Assistant Professor in the Sciences Department at West Coast University. His expertise in biomedical research includes studies in neuroscience, molecular biology, and toxicology and he has published in these fields. He has a keen interest in fostering and mentoring student research projects both in basic sciences as well as clinical practice.

Home Study Correspondence Course (#02-2099-14014)

"Periodontal Screening: Patient Attitudes and Clinical Care Decision Making "

2 CE Units – ADHA/CDHA Member $25, Non-member $35

Circle the correct answer for questions 1-10

1. Periodontal disease has been most frequently linked to which of the following chronic inflammatory diseases?
   a. heart disease, rheumatoid arthritis and diabetes
   b. heart disease, tuberculosis and diabetes
   c. rheumatoid arthritis, diabetes and shingles
   d. diabetes, fibromyalgia and heart disease
2. Periodontal disease occurrence and progression is currently understood to be a complex interrelationship between _____ and _____.
   a. pathogenic bacteria and the central nervous system
   b. pathogenic viruses and the host-response system
   c. pathogenic viruses and the digestive system
   d. pathogenic bacteria and the host-response system
3. Gingivitis is most often correlated to gram positive facultative cocci. Which of the following gram negative obligate anaerobic rods is also correlated to gingivitis?
   a. Strep mitis
   b. P. gingivalis
   c. Fusobacterium nucleatum
   d. Strep sanguis
4. Bacteria that are unequivocally related to the progression of periodontal disease are known as the "red complex." These include which of the following?
   a. P. gingivalis, T. denticola and T. forsythensis
   b. F. nucleatum , T, denticola and S. mitis
   c. T. denticola, P. gingivalis and P. intermedia
   d. T. forsythensis, F. nucleatum and P. intermedia
5. Which of the following population groups are most susceptible to periodontal disease?
   a. individuals with a family history of periodontal disease
   b individuals with a family history of cancer
   c. individuals with a weakened immune system
   d. both a and c
   e. all of the above
6. Periodontal Screening and Recording Index (PSR) is a popular methods to screen for periodontal disease. Which of the following indicators are scored with this method?
   a. probing, bleeding and calculus
   b. probing, attachment level and bleeding
   c. probing, x-rays and bleeding
   d. probing, attachment level and x-rays
7. The pathogenic bacteria which inhabit deeper sites and invade the surrounding tissues, thereby making it more difficult to remove with mechanical debridement, are _____ and _____.
   a. A. actinomycetemcomitans and P. intermedia
   b. P. gingivalis and A. actinomycetemcomitans
   c. T. denticola and T. forsynthesis
   d. A. actinomycetemcomitans and F. nucleatum
8. The BANA –enzyme test is used to detect the presence of three specific periodontal pathogens. The advantage of the BANA-enzyme test over others is:
   a. it can be performed with a saliva sample and is ready in an hour
   b. it can be performed at chairside with plaque samples and is ready in minutes
   c. it is 100% accurate with no false positives
   d. it can be self-administered at home with immediate results
9. Research findings from the patients who participated in the study indicated that:
   a. after receiving patient education and the BANA-enzyme test, the majority shifted their preference from receiving a "cleaning" to receiving a comprehensive periodontal evaluation
   b. after receiving positive results from the BANA-enzyme test and patient education, the majority indicated a preference to utilize several adjunctive oral hygiene aids in addition to brushing
   c. both a and b
   d. all of the above
10. Research findings from the RDHs who were surveyed about microbial and genetic testing indicated that:
    a. most had been practicing for over 10-14 years
    b, most were familiar with several microbial and genetic testing methods for periodontal screening
    c. the top reasons why these tests were underutilized included availability and doctor/patient acceptance
    d. all of the above

The following information is needed to process your CE certificate. Please allow 4 - 6 weeks to receive your certificate. Please print clearly:

CDHA Membership ID#: _____ Expiration:_____ ❑ I am not a member

Name: _____ License #: _____

Mailing Address: _____

Phone: _____ Email: _____

Signature: _____

Please mail photocopy of completed Post-test and completed information with your check payable to CDHA: 1415 L Street, Suite 1000, Sacramento, CA 95814

LifeLongLearning
Periodontal Screening References

1. Gum disease found to be significant public health concern. [Internet]. Chicago (IL): American Academy of Periodontology; [updated 2011 June 24; cited 2012 February 7]. American Academy of Periodontology website. Available from: http://www.perio.org/consumer/cdc-research.htm
2. Types of gum disease. [Internet]. Chicago (IL): American Academy of Periodontology; [updated 2011 April 01; cited 2012 February 7]. American Academy of Periodontology website. Available from: http://www.perio.org/consumer/2a.html
3. Singh S. Periodontitis and other periodontal conditions. In: Weinberg MA, Westphal C, Froum SJ, Palat M, &Schoor RS. Comprehensive periodontics for the dental hygienist (3rded). Upper Saddle River, NJ: Pearson Education Inc. 2010. p. 128-144.
4. Friedewald VE, Kornman KS, Beck JD et al. The American Journal of Cardiology and Journal of Periodontology Editors' Consensus: periodontitis and atherosclerotic cardiovascular disease. J Periodontol. 2009;80(7),1021-1032.
5. Frydman A, Simonian K. Aggressive periodontitis: the historic quest for understanding. J Calif Dent Assoc. 2011;39(6),377-381.
6. Leonhardt A, Carlén A, Bengtsson L, Dahlén G. Detection of periodontal markers in chronic periodontitis. Open Dent J. 2011;5,110-115.
7. Page RC, Eke PI. Case definitions for use in population-based surveillance of periodontitis. J Periodontol. 2007;78(7),1387S-1399S.
8. Michalowicz B, Diehl S, Gunsolley J et al. Evidence of a substantial genetic basis for risk of adult periodontitis. J Periodontol. 2000;71(11):1699-1707.
9. Hamdy A, Ebrahem M. The effect of interleukin-1 allele 2 genotype (IL-1a(-889) and IL-1b(+3954)) on the individual's susceptibility to peri-implantitis: case-control study. J Oral Implantol. 2011;37(3),325-334.
10. Kar K, Simonian K, Nowzari H. Dynamic therapeutic approach for individuals affected with aggressive periodontitis. J Calif Dent Assoc. 2011;39(6),401-415.
11. Armitage GC. Classifying Periodontal Diseases- a long standing dilemma. Periodontol 2000. 2002;30(1),9-23.
12. Ziebolz D, Szabadi I, Rinke S, Hornecker E, Mausberg RF. Initial periodontal screening and radiographic findings - A comparison of two methods to evaluate the periodontal situation. BMC Oral Health. 2011;11(1),1-6.
13. Corbet E. Practical periodontal screening and diagnosis. Int Dent J. 1998;48(3 Suppl 1),268-274.
14. Khocht A, Zohn H, Deasy M, Chang K. Screening for periodontal disease: radiographs vs. PSR. J Am Dent Assoc. 1996;127(6),749-756.
15. Khocht A, Zohn H, Deasy M, Chang K. Assessment of periodontal status with psr and traditional clinical periodontal examination. J Am Dent Assoc. 1995;126(12),1658-1665.
16. Shaddox LM, Walker C. Microbial testing in periodontics: value, limitations and future directions. Periodontol 2000. 2009;50(1),25-38.
17. Van Winkelhoff AJ, Winkel EG. Microbiological diagnostics in periodontics: biological significance and clinical validity. Periodontol 2000. 2005;39(1),40-52.
18. D'Ercole S, Catamo G, Piccolomini R. Diagnosis in periodontology: a further aid through microbiological tests. Crit Rev Microbiol. 2008;34(1),33-41.
19. Levi D, Csima A, Birek P, Ellen RP, McCulloch CA. Impact of microbiological diagnostic tools in the management of periodontal disease. Res Microbiol. 1993;152:631-639.
20. Genco RJ & Williams RC. (Eds.). Periodontal disease and overall health: A clinician's guide. Yardley, PA: Professional Audience Communications, Inc. 2010.
21. Nakano K, Nemoto H, Nomura R et al. Detection of oral bacteria in cardiovascular specimens. Oral MicrobiolImmunol. 2009;24(1),64-68.
22. Taylor GW, Borgnakke WS. Periodontal disease: Associations with diabetes, glycemic control and complications. Oral Dis. 2008;14(4),191-203.
23. Loesche W, Giordano J, Hujoel P. The utility of the BANA test for monitoring anaerobic infections due to spirochetes (treponemadenticola) in periodontal disease. J Dent Res. 1990;69(10),1696-1702.
24. Loomer P. Microbiological diagnostic testing in the treatment of periodontal diseases. Periodontol 2000. 2004;34(1),49-56.
25. Barnett ML. Synopsis of oral health, systemic health, and quality of life; Presented by PE Petersen at Coordination Meeting on Oral Health and Systemic Health Periodontal Medicine: Health Policy Implications; Geneva, Switzerland, Dec 5, 6, 2002. J Periodontol. 2003;74,1081-1086.
26. Loesche W, Bretz W, Kerschensteiner D et al. Development of a diagnostic test for anaerobic periodontal infections based on plaque hydrolysis of benzoyl-dl-arginine-naphthylamide. J ClinMicrobiol. 1990;28(7),1551-1559.
27. Loesche W, Lopatin D, Stoll J, van Poperin, Hujoel P. Comparison of various detection methods for periodontopathic bacteria: can culture be considered the primary reference standard? J ClinMicrobiol. 1992;30(2),418-426.