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Periodontal Disease:

Treatment, Cause and Prevention

"I cannot teach anybody, anything. I can only make them think" ~Socrates

Periodontal gum disease is most commonly caused by continual, long term neglect of proper dental hygiene. It's a type of disease that people often neglect because they do not understand the long term effects it may have on their overall health. This disease starts to develop at a young age with bad hygiene and continues into adulthood as a result. Periodontal gum disease associates with a chain of many problems that happens in the sulcus, gingival margin and the tooth itself. The oral cavity is made up of few parts.

The periodontium is the oral region of the mouth containing gingiva, sulcus, cementum which is the root surface portion of the tooth, connective tissues and bone. The disease usually affects the gums as well as surrounding teeth. If not treated in a timely manner, this disease will cause severe tooth loss and eventually it will result in the need for implants or dentures for the rest of your life. As a health care professional in a dental office, I have seen this in multiple patients. Many of the patients that visit my dental office often express regret of not having taken care of their teeth starting at a young age, where these bad habits eventually form into a lot of pain and costly dental procedures. Dental procedures cost a lot of money, regardless of dental insurance or paying out of pocket.

There are three major steps for the progression of periodontal disease. The first step of periodontal gum disease is Gingivitis. Gingivitis is the merciful form of periodontal disease. Gingivitis is most noticeable when your gums are red and swollen from poor oral hygiene; incorrect brushing and improper flossing as well as not brushing twice a day and not flossing regularly. The tartar and bacteria in your mouth will progress when it is not being cleaned or treated. The space between the teeth which is called the sulcus, deepens and a pocket starts to form. When checking with a perio probe, the numbers should be between 1-3 for healthy gums, 4 is still alright but once it slides in further and the readings are 5 or more, that is an obvious sign of the formation of periodontal disease. When your gums also bleed while probing, it means that your gums are inflamed and there is bacterium that is eroding the maxillary and mandibular bones. Once bone loss starts occurring, it affects the mobility of the

teeth. To prevent the progression of periodontal disease, it is best to get regular checkups with your dentist and also frequent cleanings. The majority of the population should get dental cleanings at least twice per year; every six months or if you already have periodontal disease, it is highly recommended to get your cleanings every three months.



The second step is Periodontitis. The inflammation of the disease progresses to the bone and supporting teeth. The periodontal ligaments begin to break away from the body of the teeth, and the gums start to recede. When recession occurs, sensitivity takes effect. The teeth then become sensitive to outside stimuli such as hot and cold temperatures, sweets, air, and any other foreign bodies that come in contact with the teeth. The pockets get deeper, making it much harder to clean the area with a tooth brush as well as using the cavitron while getting your dental cleaning. The gums become more swollen and red as the inflammation gets worse. Bleeding becomes more prominent when using slight pressure on the gums. The bacterium starts to spread and begins destroying the bone. When this occurs, teeth become loose and may need to be extracted or gum surgery may be needed to slightly improve the area.



This photo shows what beginning stages of periodontal disease looks like. As you can see, we have rolled inflamed gums. This person is most likely a smoker since the gums are pink/salmon colored and not red because smoking causes the blood vessels to be constricted which hampers the blood flow to the gums. Looking at the above picture we can see the recession on a few of the mandibular teeth, mostly anterior and pre molars. As the picture above shows, poor hygienic habits can lead to cosmetic problems which can have a negative affect on your personal and professional life. Referring to my quote by Socrates, I can only show you what to expect but it is up to you to make a decision about your dental hygiene.

The final step of periodontal disease is advanced periodontitis. Pocket depths are close to 10mm, pockets may be filled with exudate (pus) and extremely difficult to clean due to the depth of the pockets. Periodontal ligaments are completely detached from the teeth and bone loss is extremely high. Teeth become very mobile and in some cases need to be extracted in order to stop the disease from spreading to the adjacent teeth.



As you can see in this photo, we have advanced periodontitis showing how the disease has spread across the entire oral cavity. Recession of the gum line and roots are more apparent to the naked eye. Severe bleeding with inflammation occurs, showing that this person is suffering due to their bad oral hygienic habits.

Periodontal gum disease, if caught in its preliminary stages can be treated and possibly reversed before it reaches the final stage. The spread of this disease occurs amongst the population for many reasons. Improper brushing, irregular flossing and not going to the dentist as often as one should, can take a toll on an individual's hygiene. Smoking, diabetes, heredity and other life factors can contribute a lot to this disease. When not treated properly, it can affect other parts of the body since the disease travels through the blood stream. Your heart, lungs and other parts of the body can be greatly affected by this. If everyone would start going to the dentist on a normal basis, the percentage of the population with periodontal gum disease would decrease tremendously just by having good oral hygiene.

*"It is no use saying, 'We are doing our best.' You have got to succeed into doing what is necessary." ~
Winston Churchill*

One of the major risk factors for periodontal disease is Smoking. Millions of people around the world today are current smokers. From young adults to the elderly, smoking is a universal problem. As much as we're trying to help people stop by using smoking cessation tips and benefits, people don't seem to care about their overall health. Working in a dental office, I experience many patients who are smokers with periodontal disease. Some patients are at the beginning stages of periodontal disease which is gingivitis. When assessing a new patient for my office, we always ask the most important questions before coming into clinical contact with a patient.

During the evaluation process, we try to assess the more important factors; Are you currently a smoker? How many cigarettes do you smoke a day?

If the answers are yes, then do you plan on quitting? These questions regarding seeing a periodontist needs to be addressed at all times. Tobacco use is a risk factor when a patient is trying to quit because it can save your oral health as well as your overall health. Dentists and Hygienists try to follow a smoking cessation protocol which includes the 5 A's. The 5 A's are: Ask, Advise, Assess, Assist and Arrange. The protocol goes as follows.

When a patient first walks into any dental office, we always ask the main questions as I mentioned earlier and go over their medical history. We always ask our patients if they smoke regardless if they don't. So the first step of the 5 A's would be Ask. We present the patient with questions related to tobacco use without trying to sound judgmental. We explain to them that tobacco use is a health issue not as a moral or social issue. We try to get facts from the patient without making them defensive. There are also many adolescents that smoke whose parents don't know so we try to obtain their honesty while maintaining their privacy. Parents, who smoke at home while in the presence of their children, also set a bad example because children are 70% more likely to become smokers as adults.

The next step would be Advise. We advise every patient about tobacco use. We address them in a caring and compassionate manner so that patients realize that the clinician is interested in the patient's health and well-being. Patients may or may not be impressed by the discussion of future health problems or the effects of tobacco use. We show the patients what the inside of their mouth looks like when doing an oral examination to demonstrate what the effects of tobacco use are having on them. Some indicators during the oral examination on tobacco use are; Halitosis, calculus, staining of the teeth, gingival or periodontal infections and soft tissue lesions. When advising the patients, we always listen to what they have to say. We ask these patients if they want to quit and we listen to their reasons why they may or may not want to quit. Many tobacco users want to quit, and their reasons might not be because of health but by addressing the issue, it may help them focus and strengthen their reasons. These advisements can increase the long-term success of a patients smoking cessation as well as helping us in offering the best advice for the possibility of patients permanently quitting smoking.

After advising, we go into Assessing. During the assessment phase, we ask patients if they are ready to quit. If the patient is ready, we determine if the patient could best be treated at our practice or where ever their current dental office is. Some patients may not know what steps to take, so a referral may be needed. We may refer them to a specialist or their family doctor to prescribe medicine to help them with the cessation process. If a patient is not ready to quit, we then go into another Hygiene protocol which are the 5 R's. These include: Relevance, Risks, Rewards, Roadblocks and Repetition. What each one means is here, as follows:

- *Relevance* means the patient or patients indicate their personal importance of why they are quitting or want to quit.

- *Risks* meaning patients acknowledge the negative consequences of continuing use of tobacco.
- *Rewards* are which patients acknowledge their personal benefits of quitting tobacco use.
- *Roadblocks* would be patients having barriers to quitting and the clinician helps address there barriers with them.
- *Repetition* is when we reinforce the motivational message at every visit to patients so that they know we are there for them and we care and want what is best for them.

If a patient is ready to quit, we try to provide the treatment at the dental office if it is available at the time. When a patient is fully ready to quit, we then assist them in every possible way. Assisting patients mean we set a quit date and it is preferably within two weeks since we are trying to accomplish something that will last a life time. We let the patient know that they should tell family and friends about quitting so that they can get the most support possible since it may be a difficult time to cope with. We warn the patient that they may go through withdrawals and to anticipate any challenges ahead of them. Some of these challenges may be people smoking in front of them, social places that allow smoking, being outdoors next to people that smoke, after eating or driving their car, etc. We advise the patient to remove all tobacco related products from home and work. As this is happening, we offer counseling if the patient feels it is necessary. Total abstinence from smoking is essential and not a single puff of any tobacco products is counterproductive to their success. We review the patients past quitting attempts and help them figure out what contributed to the relapse prior to cessation so that we may be able to hinder another relapse. We discuss what challenges that will inevitably happen that will be hard for the patient to help them overcome them. One of the factors of relapse can be alcohol use, so we inform the patient to stay away from it because it may trigger the association of smoking.

The last and final stage of the 5 A's is Arrange. A follow up is made for patients who have completed a difficult phase in their life making sure that everything went well. We suggest that patients post up quit dates as a reminder that they accomplished something very important in their life. We congratulate and praise these patients who have remained tobacco free. It makes us, the clinicians and dentists feel like we accomplished a tough task as well.

"I want you to embark on the truth of loving yourself because when you love yourself and when you appreciate yourself, you will make healthy changes in your life for healthy reasons."~Steve Maraboli

So what does smoking cigarettes do to your oral health? First of all, I can say that it disrupts many things in your mouth. Patients come in with severe cases of halitosis and staining of the teeth. Patients experience the loss of taste buds and their sense smell. Smoking also constricts the blood vessels which can lead to systemic conditions such as heart disease, stroke, numbness in the extremities, etc. Patients may also have problems with placing dental implants,

can get canker sores or soft tissue lesions in the mouth. We strongly advise having a biopsy taken of the suspicious area for a deeper review because it poses a risk because the affected area runs the risk of turning into oral cancer if not treated within a timely manner.

I will now introduce a few patients that I have seen and dealt with to give you an overall experience of what smoking and periodontal disease does to your overall oral health. I will keep my patient names anonymous and will introduce them with different names for privacy reasons.

I have a patient who is a close friend of mine who came into my school for a regular dental check up and cleaning. His name is Michael, 39 years old, currently a heavy smoker. Michael smokes more than a pack of cigarettes a day. He is over weight for his age and height, has high blood pressure and has not seen a dentist for more than 15 years. As I am giving him an oral examination, I noticed and wrote down on his dental chart that he has some bone loss, bleeding gums, deep pocket depths mostly in his posterior teeth and a lot of plaque and calculus accumulation on his posterior teeth and mainly on his anterior teeth. Conversation as follows:

Me: Michael, how often do you brush your teeth?

Michael: I try to at least brush twice a day but because of my work schedule I usually brush just once.

Me: When was your last dental visit?

Michael: I would have to say more than 15 years ago.

Me: Any specific reasons as to why you neglected your oral health?

Michael: Never had the time, I don't have dental insurance and didn't think my teeth were in bad shape.

Me: Well Michael, due to the fact that you have not seen a dentist in over 15 years, you have a lot of bleeding, deep pocketing in certain teeth and tenacious calculus buildup all over. Do you know that smoking as a huge affect on your over health?

Michael: I have heard about it but never thought it could do that much damage to my mouth.

I explained to Michael all the effects of smoking and his facial expressions turned from being calm to worry. I told him that I need to bring a dental faculty to look over my diagnosis and he will explain more since I am still learning about how to assess these types of situations. The doctor has a lot more experience in the field than I do. As I brought one of the dental faculty to my operatory, she did a quick examination and noticed these white spots on his retromolar pad. A retromolar pad for those who don't know is the gum tissue behind your lower third molars. The doctor asks him about his current smoking situation and explains to him that the retromolar area should be taken for biopsy because it is linked to and may develop into oral cancer at some point in the future. Many patients think that smoking cigarettes does not have a great effect but it certainly does. Michael does not currently have insurance but he will try to go to an oral specialist to ascertain the gravity of the situation. I

highly advised Michael that it is best for him to at least try to quit for many health reasons. He has healthy teeth for now but if the disease progresses from his habits; he may be in big trouble. Not only will his teeth become mobile, the cost for certain surgeries to decrease the progression of periodontal disease is expensive.

A study has shown that there is a relationship between periodontal disease and smoking. According to the journal of Smoking and Periodontal Disease, "it has been observed that tobacco can play an important role in periodontitis. This hypothesis has recently been confirmed by numerous epidemiological studies, which reveal a higher prevalence and severity of periodontitis in smokers compared to non-smokers, according to clinical parameters."(pg1).

As you can see, when smoking cigarettes or any other form of inhalant, it can do a lot of harm and damage to the oral cavity. Not only do cigarettes harm your entire body by causing cancer but it plays a major role as relating to the teeth as well. Even when doing dental procedures for the disease, people who decide to keep smoking and not cut back, will fail to see any changes. It may aggravate the problem. According to the journal of Smoking and Periodontal Disease, "It has been noted that both the long term and short term response to treatment are worse in smokers. Among refractory patients, a high prevalence of up to 90% of smokers has been considered. Based on this data, tobacco has been observed as one of the most important single risk factors of periodontal disease." (pg1).

Going back to my patient Michael, I did a follow up a month later to see the status of his teeth and smoking habit. I did a quick check up of all his teeth. Noticed that he has been cleaning them a lot better, but the smoking has not stopped. He says, "It is hard for me to quit since I am going through a lot and have been stressing about a few things, but I know that this is not a good excuse about my overall health and my teeth". I explained to Michael that stress is just a mental excuse that people use and that smoking a cigarette will calm them down, but it will not. I asked him if he went to see a specialist concerning the white spots on this retromolar pad and he never went. I told him I cannot force you to go and see a specialist but I highly advise you that it would be a very good idea to have it checked out. Having oral cancer is not something you would want. It is better to know now of what is going on than worrying about it later.

"You need to learn how to select your thoughts just the same way you select your clothes every day. This is a power you can cultivate. If you want to control things in your life so bad, work on the mind. That's the only thing you should be trying to control." ~ Elizabeth Gilbert

There was a study done between 340 males and 549 females, both smokers and non-smokers and the effect of periodontal disease between these volunteers. Their ages were ranging from 21-47. A questionnaire was filled out prior to their examination. The questionnaire was referring to gender, age and the consumption of cigarette smoking on a daily basis. The examination for

each individual was to check each side of the tooth; lingual, buccal, mesial and distal, as well as recession, mobility, probing attachment level and probing depths. The instrument that was used for their examination was a dental probe which has millimeter markings. A marking of 1–3 are normal gums, 4 were somewhat healthy, 5 and above is a red flag.

According to *The Journal of Smoking and Periodontal Disease*, “The distribution of smokers and non-smokers is similar, 47.4% of the subjects being non-smokers, and 52.6% smokers with an average of 22 cigarettes per day. Among the smokers, the least numerous groups of males is that smoking less than 10 cigs/day followed by those smoking more than 21cig/day, so that most smokers lie in the 11–20cg/day group. In females, the latter group is also the most numerous, although the least numerous group is that smoking more than 21cig/day followed by that of less than 10cig/day. In general, both for males and females, from 50 years up, there is a considerable reduction in the number of smokers, perhaps influenced by the development of medical problems aggravating by smoking and aging” (pg 2–3). Looking at these numbers, it is easy to say that we are dealing with a lot of heavy smokers. Between males and females, the distribution of smoking is fairly similar. People who smoke more than a pack a day are more likely to get periodontal disease. People who smoke less than a pack a day should consider quitting or cutting back for the disease not to progress. I witness many patients every week that come in and smell like an ashtray and when it comes to going over their examination. It bothers me how so many patients just nod their head that they understand but will not take the initiative to quit or at least try. Looking further into the study, “The factor of sex affects the severity of periodontal disease, showing statistically significant differences for GR (gingival recession), PD (pocket depths), and PAL (probing attachment level). Males have a 17% higher recession, 6% greater probing depths and 8% more probing attachment loss than females. On average, males show higher attachment loss than females. Age has an increasing effect on mobility 2.3% annually, each year implying an increase in mobility” (pg 3–4).

With these statistics, it is proven that males are at a higher risk of periodontal disease when it comes to smoking. Is it because they have a lot more stress and other life problems? We may never know, but with these significant factors, males should realize that what they are doing to their overall health is becoming a serious issue in regards to their oral health as well.

“Understanding is the first step to acceptance, and only with acceptance can there be recovery.” ~ J.K. Rowling

I had another patient come into my office who smokes more than a pack a day. A male in his 40’s, average weight, health history was up to date with no significant changes and was in our office for some dental work. When the periodontist did the examination, I charted in her notes that he had very deep pocket depths, a lot of recessions and mobility of his anterior teeth. We recommended to start off with a scaling and root planing of all four quadrants and see what the outcome would be after a month. If his gums don’t shrink to

normal size, we are going to have to do gum surgery. We also recommended the patient to quit smoking because it is a major risk factor for the oral cavity. We explained to the patient that smoking is strongly associated with attachment loss and bone loss. This was new news to the patient and he wanted to proceed with the deep cleaning first and see what the outcome would be. It was also mentioned to him that with this cleaning and for the outcome to be achievable, he needed to consider quitting or cutting back. It does not make sense for the patient to go through all this dental work and expenses when in the end, he will still smoke on a regular basis.

According to an article, *Want Some Life Saving Advice*, “Recent studies have shown that tobacco use in the form of cigarette, cigar, or pipe smoking, as well as smokeless tobacco use, are significant risk factors in the development and progression of periodontal disease. In turn, research links periodontal disease to increase risk of heart disease, stroke, poorly controlled diabetes and premature babies” (pg1). Periodontal disease is also linked to many other systemic conditions in the body. Everything that happens in the mouth is circulating within the blood and being transferred throughout the body. All that bacteria that is in your mouth is being stuck on your teeth and when not fully removed, it goes underneath the gums where it gets absorbed by all the surrounding tissue. Tobacco has about 5,000 different chemicals. When inhaled, all these chemicals are going straight to the lungs and the blood stream, which is then delivered to all parts of the body. Since smoking constricts the blood vessels, many people who have periodontal disease will not notice any difference in their mouth because their gums barely bleed. When patients see a periodontist and hear the diagnosis of their examination, they are in complete shock. Who would have thought that smoking leads to periodontal disease? Usually you would hear that its age, genetics, gender, not seeing the dentist as recommended. Improper brushing and flossing may have an impact on the disease as well. It is up to us dental professionals to be more direct with patients and help them realize that it is better to quit now then be sorry later.

“Everyone thinks of changing the world, but no one thinks of changing himself.” ~Leo Tolstoy

As we look further within the disease, research has shown that periodontal disease is also linked with many other systemic conditions. Some of which are cardiovascular, pregnancy, coronary heart disease, diabetes mellitus and many more. It has come to my attention that even though we treat the disease by getting deep cleanings and periodontal surgery; people don't understand that if they're not following the guidelines we give them to stop the disease from spreading; it will be a continual problem. According to an article by *Jemin Kim*, “For decades, physicians and dentists have paid close attention to their own respective fields, specializing in medicine pertaining to the body and the oral cavity, respectively. However, recent findings have strongly suggested that oral health may be indicative of systemic health. Currently, this gap between allopathic medicine and dental medicine is quickly closing, due to

significant findings supporting the association between periodontal disease and systemic conditions such as cardiovascular disease, type 2 diabetes mellitus, adverse pregnancy outcomes, and osteoporosis”(Periodontal disease and systemic conditions). It bothers me that periodontal disease is very serious and most people don’t take into consideration the damage this disease can wrack on the body. There have been significant findings about the ethological and pathological linkage to the chronic disease and other systemic conditions. Some of these findings are; smoking, steroids, cancer therapy medications, anti-epilepsy medications, birth control pills and HIV. These findings educate many researchers in finding a treatment to help eliminate the problem for good. Whether it is with surgery or antibiotics, dentists and doctors need to take action to let their patients know the harm it can cause.

Cardiovascular disease is one of the most common causes of deaths worldwide. It is stated that 29% of the world population’s death rates are linked to cardiovascular disease. According to an article by *Jemin Kim*, “Estimates from the year 2002 show that more than 70 million Americans were diagnosed with one of the forms of CVD, which include high blood pressure, coronary heart disease (myocardial infarction and angina pectoris), peripheral arterial disease, and stroke, with atherosclerosis as the principal cause of all CVDs. Atherosclerosis is thus responsible for 50% of all mortality in the United States, Europe, and Japan.²¹ After adjustment of other risk factors, studies indicate that severe periodontal disease is associated with a 25% to 90% increase in risk for CVD.²² One study showed that 91% of patients with CVD demonstrated moderate to severe periodontitis, while 66% of cardiologically healthy patients had periodontitis. The same study showed a statistically significant correlation between coronary artery disease and periodontitis” (periodontal disease and systemic conditions).

“It has been said that the great events of the world take place in the brain. It is in the brain, and the brain only, that the great sins of the world take place also.” — Oscar Wilde

Society is changing every year and as you have noticed, they are trying to change it by advertising healthy eating, going to the gym, taking your daily vitamins, seeing your doctor for an annual checkup, etc. When changing to a healthier lifestyle, the chances of getting any type of disease or condition can be greatly reduced. My doctor had a male patient, in his 40’s come to our office for deep cleanings and periodontal surgeries. He was overweight and was not eating healthy at all. Smoked about a pack a day and had a lot of problems with his overall health and his teeth. We advised him to change his lifestyle and come for his treatments every week and follow the guidelines after each surgery. After six months had passed, he came to us again for a follow up and gave us a welcoming surprise. Not only did the patient quit smoking, he started to eat healthy and exercise every day. His workouts consisted of running every single day for an hour or two and some mild weight training. He lost a tremendous amount of weight and when we did a recall examination; his gums were back to normal limits. The doctor and I gave a sigh of relief and were

exuberant because out of all the patients we have had and tried numerous times explaining to them the severity of the disease; he actually listened and made the necessary changes to his lifestyle with fantastic results. He felt a huge difference in his body and had a lot more energy than what he felt before. Knowing that there are patients out there who are willing to make a change gives you pride for the work you have done and makes you feel accomplished and reminds me of why I got into this line of work in the first place.

Periodontal disease may correspond to cardiovascular disease in retribution to many risk factors for atherogenesis. Atherogenesis is the formation of deposits in the arteries. Ensuing to deliberate periodontal disease as a risk factor for atherosclerosis and other cardiovascular problems, the plausibility of all these pathogens that correspond with the periodontal infection should be localized in a secretion or other atheromatous plaques. According to an article by *Jenin Kim*, “Investigating this by sampling carotid atheromatous plaques, Cairo et al.²⁴ detected *T. forsythensis* DNA in 79%, *F. nucleatum* in 63%, *P. intermedia* in 53%, *P. gingivalis* in 37%, and *A. actinomycetemcomitans* in 5% of the samples from carotid atheroma patients. In addition to carotid, coronary, and aortic atherosclerotic plaques, these various oral bacteria were also detected in occluded arteries from patients with Buerger Disease.²⁵ One would expect that these pathogens would induce the release of proinflammatory cytokines. Etiologically, gentle mastication releases bacterial endotoxins from the oral cavity into the bloodstream, inducing cytokine production (TNF, IL-1, and PGE₂).¹³ Further, animal studies should be able to demonstrate atherosclerosis induced by periodontal pathogens.²⁶ Animal models provide a more thorough understanding of the pathogenesis of CVD; specifically, with the use of gene-targeted animals such as the apolipoprotein E-knockout (apoE -/-) mouse” (Periodontal disease and Systemic Conditions).

Chronic infection of periodontal disease and atherogenesis can travel by two ways. One way is with direct invasion into the arterial walls and the other being the release of the response to the infection of the systemic inflammatory arbitrators with atherogenetic effects. According to an article by *Jenin Kim*, “These pathogens, especially *P. gingivalis*, have demonstrated the ability to interact with the endothelial surface and to induce smooth-cell proliferation, causing damage and impairing the vasomotor functionality of the endothelial cells.^{2, 26, 31, 32} Serum C-reactive protein (CRP) plays a role in endothelial dysfunction, and elevated levels of CRP provide insight into the linking of periodontal disease and CVD.^{2,33-36} In patients with periodontal disease who have elevated plasma levels of both fibrinogen³⁷ and TNF-alpha, there is an association with increased carotid intima-media thickness (IMT).³⁸ IMT and left ventricular mass (LVM) are alternative, yet valuable tools in measuring carotid atherosclerosis.^{5,19,22,39} However, our understanding of the mechanism linking these inflammatory markers with atherosclerosis progression is unclear” (Periodontal Disease and Systemic Conditions).

Recent cases have shown that (CRP) which is the C-reactive protein may precisely obstruct with endothelial nitric oxide (NO) possibly, by both

minimizing the formulation of NO synthase and collectively accumulating the construction of reactive oxygen, which eliminates NO. Raising the C-reactive protein secretion levels are the feature of the conversion from balanced coronary artery disease to the accumulation of a platelet-rich thrombus resulting in plaque rupture or erosion. These discoveries beam light on the basis that endothelial activity, combined with high-flown (CRP) secretion levels, is identified by the damaged systemic bioavailability of NO in coronary artery disease patients. In addition to the research of this assumption for instance; the role of CRP on NO, has showed us the analysis that CRP secretion levels are significant in concluding the possibility of NO in the systemic transmission of coronary artery disease patients.

Another vehicle through which the bioavailability of NO is reduced with oxidative inactivation is by joining reactive oxygen species. Activated by bacterial components such as LPS from *P. gingivalis*, macrophages and other cells release cytokines, leading to the systemic activation of phagocytic cells. According to an article by *Jenin Kim*, "Thus, PGE₂, IL-1 beta, and TNF-alpha all reach high and potent systemic levels. These macrophages can then transform into foam cells, inducing the production of proinflammatory cytokines, leading to endothelial dysfunction."²⁶ In a recent study, Pussinen et al.⁴² found that the main serum mediators of macrophage activation in response to periodontal disease were low-density lipoprotein (LDL) cholesterol, LPS, β_2 -glycoprotein I (β_2 -GPI), and modified phospholipids. These results led to the conclusion that periodontitis was directly associated with the ability of isolated LDL to activate macrophages through its main mediators. Moreover, the binding of LDL and the formation of foam cells have been shown to be mediated by CRP" (Periodontal disease and Systemic Conditions).

Researchers found some updated data which suggested that the slight but widespread effects of periodontitis on the metabolism and biochemical properties of lipoproteins may be inverted by periodontal treatment. Another study has shown a linkage between periodontal disease and cardio vascular disease through an interpretation of peripheral arterial disease. Peripheral arterial disease of the legs is a condition brought on by insufficient tissue effusion. This condition may be linked to both coronary heart disease and stroke. Trying to understand the relationship between periodontal disease and peripheral arterial disease is beneficial in trying to understand the clinical effect of periodontal diseases and how the treatment of these diseases may reduce the risk of developing cardio vascular disease. There is other research that tooth loss instead of periodontal disease may be another link to cardiovascular disease and other oral health issues.

"Have a heart that never hardens, and a temper that never tires, and a touch that never hurts" ~Charles Dickens

I had a patient recently come into my office for a tooth extraction which was extremely mobile and you would think that he would be able to easily remove it himself. He was Middle Eastern, in his late 40's, average weight, said

that he is currently healthy and has no known allergies to medications. I took an x-ray of tooth #11 (maxillary left canine). On the x-ray, the tooth literally looked like it was hanging on by 3 mm left of its apical root in the gums. My doctor was concerned with the rest of his teeth, so I took a panoramic x-ray which showed the entire upper and lower dentition. This patient had bone loss through the entire mouth, teeth barely hanging by the roots and missing teeth. He also had roots left in gums and is currently a heavy smoker as well. The only options that this patient had were extractions of all the teeth that are within severe bone loss limits and with the possibility of placing implants or dentures. He also needs a deep cleaning and possibly gum surgery to protect the remaining healthy teeth. Seeing these types of patients and trying to explain the harm this does to your mouth as well as your body makes it more complicated to explain. I feel that as a dentist or hygienist we need to take a lot more action. You cannot force a patient into changing their lifestyle as well as their habits but we need to take stronger action in these types of situations. It is up to us to help these patients make the necessary changes for the benefit of their health.

I had a patient come into my office this past Friday for a consultation with the periodontist. His name was Martin, 45 years old, Polish, who claims to be healthy. He smokes up to four packs of cigarettes a day. (Yes I wrote that, smokes four packs a day). His current work status is being a long haul truck driver who drives across the United States delivering merchandise to different companies. He has partial dentures on top and bottom since he still has some of his teeth and he was inquiring about having implants placed in his mouth. My doctor took a look at his current x-rays and he needed a lot of major dental work. The doctor discovered that the partial denture on top had never been taken off. He wears them while he sleeps and doesn't even clean it properly. When the doctor removed his upper denture, it was filled with a whitish, cottage cheese looking fungus. This was the most disgusting thing I have ever seen in my life and in a patient's mouth. To walk around like that and not notice any fowl odor is a disgrace to oneself. My doctor was so repulsed by this find that she couldn't bare the smell or view of his mouth. I found out that he had come to her once before for a consultation and she told him that he needed to rinse his mouth with a special kind of mouth rinse for dentures so that his gums can be clean and free of bacteria as well as the dentures themselves. When he showed up this past Friday for the second time, she advised that he needs to cut down on smoking, because smoking four packs a day will not allow the implants to properly adhere to his jaw bones. His response to that was "I am a truck driver. What am I suppose to do for so many hours when I'm traveling far distances. It is the only accommodation I have besides eating while driving for a long period of time". My doctor's response to that was, "Well then stop smoking and it will not be an issue for you". She explained to him that placing implants in a heavy smoker's mouth will make the implant and bone around it not adhere to one another. It would impede the placement procedure of the implant and the body would most likely reject it. He also needed at least 2-3 weeks of major rinsing to remove all the bacteria that had accumulated on his gums.

There is no point of doing an implant procedure if you are not going to take care of yourself and your oral environment. She also told him to make sure everything is clean before coming into the office for his next visit. Martin in a sarcastic demeanor said, "Well, I will just start rinsing a day or two before the procedure". My doctor told him in a professional manner that if he thinks of doing that, she will not proceed with his procedure. She explained to him that this was not a joking matter and it would be beneficial to his health. Even though he didn't have many teeth left, he would need to have the remaining ones extracted. After removing his teeth, he will need bone grafting to the area so that the implants have stable bone to adhere to.

Martin has a lot of dental work to be done, but it is up to him to start taking care of his mouth and his smoking addiction. Witnessing all this within 30 minutes of his consultation, I was shocked to see that patients do not seem to understand the harm they are doing to themselves. It sometimes feels like the patients take everything as a joke and we're only advising and recommending this information to sound professional for no reason. I feel as if in their minds, and I have heard this from many patients, that they hear stories from friends and family who have had certain dental work done while smoking cigarettes or whatever bad habits or pre-existing conditions that they may have and everything seemed to be fine. In all honesty, half of these people probably went to dentists who were more concerned with money, than their oral care and told them what will make them feel better. The dentist would do the work and leading the patients to believe that everything would be fine long term. Reality check, you will end up making an appointment to another dentist and complain about the work you had done from a previous doctor and now you have complications. I have seen these types of situations multiple times and till this day, patients don't realize that sometimes you need to pay more in order to get the best possible treatment as well as going to a doctor that are highly recommended.

Going back to Martin, I believe his appointment will be in two weeks and I hope he does what he was told to do. I understand that when you are a heavy smoker like Martin, it is hard to quit but the best thing to do is to get on our cessation program. Health and teeth are the two most important conditions that need to be taken care of. Without teeth, you are limited to many things and if you're unhealthy, your body will start to shut itself down.

What happens to people who have periodontal disease and want implants? First of all a dental implant is an artificial tooth root that is placed into your jaw to replace a tooth or bridge. Dental implants are an expensive option for people who have loss of teeth due to periodontal disease. There are two different types of implants. According to an article from a periodontal website, "*Endosteal* (in the bone): This is the most commonly used type of implant. The various types include screws, cylinders or blades surgically placed into the jawbone. Each implant holds one or more prosthetic teeth. This type of implant is generally used as an alternative for patients with bridges or removable dentures". The second type of implant is "*Subperiosteal* (on the bone): These are placed on top of the jaw with the metal framework's posts

protruding through the gum to hold the prosthesis. These types of implants are used for patients who are unable to wear conventional dentures and who have minimal bone height”.

These are two examples of what a dental implant would look like.



The first image on your upper left is an example of how a dental implant looks inside your gums. The second image on your upper right is a healing abutment that is placed after having a dental implant placed into your gums. A patient will walk around with this healing abutment for about three months until the bone adheres to the implant then placement of a crown is made and cemented on for the final procedure. On your bottom left is an image of a patient with a missing tooth and what it looks like before a dental implant is placed. The bottom right image shows a patient with a dental implant in place. Notice how the dental implant looks exactly like a real tooth. In some cases, I would say that this is the best option to go with. Not only is it a single tooth but you don't have to worry as much about maintenance as you would with having a denture or a bridge. Many patients who have crowns attached together to make a bridge don't take care of it. Having a bridge means you need to floss that area all the time since you don't want food and debris underneath the crowns. Not flossing on a regular basis regardless of having a bridge or your own teeth will end up having a buildup of plaque, calculus and a fowl odor underneath the bridge, real teeth or individual crowns.

“In the end, you have to choose whether or not to trust someone” ~Sophie Kinsella

So who are the right candidates for having dental implants? These would be people who have healthy gum tissue and overall good health. Adequate bone amount in the mouth is also very important and people who are free of periodontal disease by taking care of that first before placement of a dental implant. When talking to a dentist or periodontist about dental implants, they are the ones to consult with you and make sure that you have adequate bone

and space for the implants. The procedure usually takes about an hour or two determined by how many implants they are getting on that day. The procedure is very interesting and somewhat of a quick process. The periodontist first cuts in between two adjacent teeth and spreads the gum tissue apart. Then they clean and remove all loose bone particles and granulation tissue. Granulation tissue is infected gum tissue that has a lot of bacteria surrounding it. Once the area is cleaned, the specialist will then start drilling into the bone using different screw attachments to make a big enough hole for the implant to be screwed in. Depending on the length and width of the chosen implant to be screwed in, the specialist looks at a CAT scan which is a scan of multiple lengths of your entire dentition and surrounding bone. Based on the tooth number and area, the specialist will then determine the right dental implant size. An x-ray will be taken before the implant is placed to make sure that it will be aligned correctly in the middle between the adjacent teeth. After the implant is placed, the patient waits about three months for the healing abutment to be covered inside the gum and then a 30 minute surgery which is called the uncover procedure is then done to put another cap so that in the next three months an implant crown will be placed. With this being said about the implants, a certain condition can take place when having dental implants. A condition called Peri-implant disease.

What is Peri-implant disease? It's a disease that causes inflammatory conditions that affects the soft and hard tissues around the dental implants. If you have periodontal disease that wasn't completely removed or healed, this type of condition may occur. According to an article from a perio website, "Similar to a natural tooth, bacteria can build up on the base of the implant, below the gum line. Over time, the bacteria irritate the gum tissue, causing it to become inflamed, damaging the tissue and if not caught early, causing the bone structure below the implant to deteriorate".

I have seen this case happen to two patients because they did not do exactly what was being advised. When this happens, x-rays are necessary for the removal of the failed implant. Adding bone and letting the tissue heal again over the next 2-3 months where another follow up consultation is necessary to ascertain the specific area and debating if another implant procedure should be done in that area or not.

Patients don't seem to understand that when having dental implants, they need the same care as your regular teeth do. Brushing and flossing are the two main components for maintaining dental implants. Usually Peri-implant disease occurs in patients who are smokers, having unhealthy gums, diabetes and poor plaque control. Everything that happens in the mouth is almost all caused by the same systemic conditions. It truly bothers me how people just don't seem to get it. This isn't physics or hard math, its basic hygienic knowledge that we are trying to instill in these patients.

We have come a very long way with dentistry. New techniques, materials and equipment have changed the field for the better. One type of dental specialty is periodontics. Periodontics is the study of structure of teeth, diseases and conditions that associate with the specialty and also helps in

diagnosis, treatment and prevention of Periodontal Disease. There have been new studies and clinical trials where lasers are being used for treating patients with periodontal disease instead of using the manual instrumentation of scaling and root planing. Researchers conclude lasers are not as effective as believed; additionally SRP has better outcomes in treating periodontal diseases than these lasers.

Most research is on three types of lasers. One type of laser that was being tested was the CO₂ which is the Carbon Dioxide Laser. This type of laser works on a fiber optic beam which requires mirrors and a hand piece to function. The beams temperature needs to be at a certain degree and a certain type of wavelength. The wavelength is based on its clinical application and the design of the laser. These wavelengths are measured in nanometers which represents the spectrum of ultraviolet and infrared range. The CO₂ laser works on soft tissue procedures which is high in absorption with water but does not support its utilization with mineralized tissues. According to Dr. Rossmann, "Therefore, with this CO₂ laser, no contact is made with the tissue, and no tactile feedback occurs...Divergence of the beam beyond the focal point results in a rapid loss of power density and protects the underlying tissue, causing only protein denaturation and coagulation.

The second type of laser that is being used in Periodontics is the Neodymium: Yag Laser. This laser will infiltrate through water at about sixty mm before it reduces its force to 10% of its original strength. This laser also uses wavelengths but mostly is attracted to densely pigment gingival tissues. The energy it uses is scattered energy on soft tissue instead of being absorbed by the tissue like the CO₂ laser. According to Dr. Rossmann, "One study found that the least tissue damage occurred with the smallest tip at all power settings, and there was no bleeding with the contact tip. However, the extent of tissue damage was still greater then observed with a conventional scalpel'.

The final laser that I will introduce is the Erbium: Yag Laser. This laser was FDA approved for treatment on hard tissue including bone, cementum and enamel. Yag Laser has a higher wavelength then the other two which is excellent in water absorption and absorption of hydroxyapetite making it more proficient in removing enamel and dentin then the previous lasers that I had mentioned. According to Dr. Rossmann, "It is essential to use a water spray to wet the surface during laser radiation to achieve maximum efficiency of tissue removal with minimal heat generation. The surface is left with an acid-etched appearance microscopically, which enhances the bond strength when used on enamel for cavity preparation".

Despite all this new technology in lasers and what it can do to make periodontal treatments more efficient and less traumatic gingival tissue is still controversial to the dental audience. There has not been enough research on the effects of these lasers. All lasers do what they are supposed to do; meaning debridement of the gingival tissue but the healing process and the effectiveness of the gingival tissue is still minimal. According to Charles M. Cobb, "Current evidence does suggest that the use of the Nd: Yag or Er: Yag wavelengths for treatment of chronic periodontitis may be equivalent to scaling and root

planning (SRP) with respect to reduction in probing depth and subgingival bacterial populations. However, if gain in clinical attachment level is considered the gold standard for non surgical periodontal therapy, then the evidence supporting laser-mediated periodontal treatment over traditional therapy is minimal at best. Lastly, there is limited evidence suggesting that lasers used in an adjunctive capacity to SRP may provide some additional benefit". If using one of these lasers for any type of periodontal procedure has the same effect as doing a regular scaling and root planing, then the lasers may just benefit the patient and the clinician as well.

Another issue with lasers is the healing process and that these lasers are only treating soft and hard tissues, but is it really improving people with chronic periodontitis. Each laser uses different wavelengths, so depending on how bad the gingiva is diseased, depends which laser is the right one to use. Gingival tissue is deprived of the periodontium, water, minerals, pigmentation; all of these come into effect of which laser to use. The lasers remove soft and hard tissue, but even from removing it, patients still have periodontitis because it's a factor that will not be cured.

Patients need to also take into consideration of who is treating you, how much experience the specialist has, what type of instruments or procedure is right for the patient and what will they use or give them during healing process. Lasers have come a long way but there still is insufficient evidence to support their use in the dental profession.

Periodic monitoring of periodontic status and the proper maintenance procedures should be a part of long term treatment plan for managing periodontal disease. Although many studies have concluded that maintaining a proper outcome would be ideally getting deep cleanings every two weeks in patients who have chronic periodontal disease. To maximize the total effect, patients need to maintain a daily plaque control. As one of the factors of periodontal disease is Gingivitis, it can be reversible. Therapy is aimed at the reduction of etiological factors to reduce or eliminate the inflammation. Appropriate periodontal maintenance includes personal and professional care. It is important in preventing the re-initiation of the inflammation. According to *The American Academy of Dentistry*, "Therapeutic approaches for periodontitis fall into 2 major categories: 1) anti-infective treatment, which is designed to halt the progression of periodontal attachment loss by removing etiologic factors; and 2) regenerative therapy, which includes anti-infective treatment and is intended to restore structures destroyed by disease. Essential to both treatment approaches is the inclusion of periodontal maintenance procedures".

Maintenance is one of the most beneficial factors a patient must understand. Without doing so, it will only progress and get worse. It's like how much can we let patients know to make them fully understand the situation. We are not here to take your money; we are here to help you. It is our profession and dignity that we take a stand and help the ones in need. But it is also up to the patient to compromise with what we are trying to do.

"We all live with the objective of being happy; our lives are all different and yet the same" ~Anne Frank

As a health care professional, I am not only passionate about my work but take pride in it as well. I do not see my profession simply as just a job but also a way to educate not only adults but children as well. I want to help people break their old habits and develop a solid, positive habit that will keep them healthy not only in my dental chair but in their overall well being.

As we try to educate patients on periodontal disease and its causes, we cannot force it upon them; instead we need to make a concerted effort to help them understand not only the complexity of the disease, but also the cause of it. The best offense against periodontal disease is a good defense. The offense starts in my office but the defense begins at home. As new technologies broaden the dental profession, we can conclude that getting regular cleanings and deep cleanings is the best possible way to maintain the disease. As well as doing periodontal surgeries, patients need to understand that when going through these surgeries; you need to follow the hygiene regime in order to have the best possible outcome of the treatments.

In conclusion, I personally want to change the way people view dentistry as a whole. We are here to provide a service that helps people feel comfortable coming into a dental office. The smiles that I get when I see a happy patient return to my office thanking me for helping to improve their lives reassures my choice in becoming a dental hygienist.

References:

- Albandar JM, Streckfus CF, Adesanya MR, Winn DM: Cigar pipe, and cigarette smoking as risk factors for periodontal disease and tooth loss. *Journal of Periodontology* 2000;71(12):1874–1881
- Andersen R¹, Loebel N, Hammond D, Wilson M. Treatment of periodontal disease by photodisinfection compared to scaling and root planing. *J Clin Dent*. 2007;18(2):34–8.
- Apatzidou DA, Kinane DF. *J Clin Periodontol*. 2004 Feb; 31(2):132–40. Quadrant root planing versus same-day full-mouth root planing. I. Clinical findings.
- A Pejčić, R Obradović, L Kesić... – *Facta Univ Ser Med ...*, 2007 – facta.junis.ni.ac.rs. Smoking and periodontal disease a review.
- Armitage GC. Development of a classification system for periodontal diseases and conditions. *Ann Periodontol* 1999;4:1–6
- BH Mullally – *Tob Induc Dis*, 2004 – biomedcentral.com. The Influence of Tobacco Smoking on the Onset of Periodontitis in Young Persons.
- *Carvalho LH, D'Avila GB, Leão A, Haffajee AD, Socransky SS, Feres M. J Clin Periodontol*. 2004 Dec; 31(12):1070–6. Scaling and root planing, systemic metronidazole and professional plaque removal in the treatment of chronic periodontitis
- Charles M. Cobb. AAP– Commissioned Review. Lasers in Periodontics: A Review of the Literature, Charles M. Cobb
<http://www.joponline.org/doi/pdf/10.1902/jop.2006.050417>
- Dr. Jeffery A. Rossmann. The Research, Science and Therapy Committee of the American Academy of Periodontology. *J Periodontol* 2002;73:1231–1239. Lasers in Periodontics
- Dr. Joseph V. Califano, Periodontal Disease of Children and Adolescents.
<http://www.joponline.org/doi/pdf/10.1902/jop.2003.74.11.1696>
- Dr. Paul S. Rosen. Treatment of Plaque–Induced Gingivitis, Chronic Periodontitis, and Other Clinical Conditions
<http://www.joponline.org/doi/pdf/10.1902/jop.2001.72.12.1790>
- Dr. Paul Rosen, chair; Drs. Donald Clem, David Cochran, Stuart Froum, Bradley McAllister, Stefan Renvert, Hom–Lay Wang. Academy Report: Peri–Implant Mucositis and Peri–Implantitis: A Current Understanding of Their Diagnoses and Clinical Implications. April 2013, Vol. 84, No. 4, Pages 436–443 , DOI 10.1902/jop.2013.134001(doi:10.1902/jop.2013.134001)
- Dr. Vincent J. Iacono, Member of the 1999–2000 Committee on Research, Science and Therapy. Dental Implants in Periodontal Therapy. *J Periodontol* 2000;71:1934–1942

- Genco RJ. Current view of risk factors for periodontal diseases. J Periodontol 1996;67(Suppl.):1041–9.
- George S. Manev, Christina Popova. Department George S. Manev, Christina Popova. Department of Periodontology, Faculty of Dental Medicine, Medical University
- Haffajee AD, Cugini MA, Dibart S, Smith C, Kent RL Jr, Socransky SS. J Clin Periodontol. 1997 May;24(5):324–34. The effect of SRP on the clinical and microbiological parameters of periodontal diseases.
- Hanes PJ, Purvis JP. *Ann Periodontol*. 2003 Dec; 8(1):79-98. A systematic review on the effect of systemic antimicrobials as an adjunct to scaling and root planing in periodontitis patients.
- Herrera D, Sanz M, Jepsen S, Needleman I, Roldán S. J Clin Periodontol. 2002; 29 Suppl 3:136–59; discussion 160–2. A systematic review on the effect of systemic antimicrobials as an adjunct to scaling and root planing in periodontitis patients.
- J DENT RES 0022034512457373, first published on August 30, 2012
Prevalence of Periodontitis in Adults in the United States: 2009 and 2010
- Jemin Kim and Salomon Amar, Periodontal disease and systemic conditions: a bidirectional relationship, Odontology. Author manuscript; available in PMC Jul 7, 2008. Published in final edited form as: *Odontology*. Sep 2006; 94(1): 10–21. doi: [10.1007/s10266-006-0060-6](https://doi.org/10.1007/s10266-006-0060-6)
- Jyoti Mohitey^{1*}, Rahul Redasani. Department of Periodontics, School of Dental Sciences, Krishna Institute of Medical Sciences Deemed University, Karad– 415539, (Maharashtra), India. Case Control Study To Assess Association Between Periodontal Infection And Coronary Heart Disease. JKIMSU, Vol. 1, No. 2, July–Dec. 2012
- Kalib Inde, March 2011. Periodontal Gum Disease
<http://www.studymode.com/essays/Periodontal-Gum-Disease-636779.html>
- Lang NP, Berglundh T on Behalf of Working Group 4 of the Seventh European Workshop on Periodontology: Periimplant diseases: where are we now? – Consensus of the Seventh European Workshop on Periodontology. J Clin Periodontol 2011; 38 (Suppl. 11): 178–181. doi: 10.1111/j.1600-051X.2010.01674.x
- Lisa Dows–Mayo. Dental lasers and the dental hygienist.
<http://www.rdhmag.com/articles/print/volume-28/issue-6/feature/dental-lasers-and-the-dental-hygienist.html>
- Matjaz Lukac Ph.D., Tom Sult M.D., Robin Sult R.N, Article: J. Laser Health Academy, Vol.2007, No.1 (2007). Journal of Laser and Health Academy.
www.laserandhealth.com

- N Engl J Med 2006; 355:1885–1894 November 2, 2006 DOI: 10.1056/NEJMoa062249 Treatment of Periodontal Disease and the Risk of Preterm Birth
- ROBERT GENCO, D.D.S., Ph.D., STEVEN OFFENBACHER, D.D.S., Ph.D., M.Sc. and JAMES BECK, Ph.D. Periodontal disease and cardiovascular disease Epidemiology and possible mechanisms. *The Journal of the American Dental Association* (June 2002) 133, 14S–22S © June 2002 American Dental Association doi: 10.14219/jada.archive.2002.0375
- Salomon Amar, Xiaozhe Han, The impact of periodontal infection on systemic Diseases. Department of Periodontology & Oral Biology, Goldman School of Dental Medicine, Boston University, Boston, MA, U.S.A.
- S.Akhtar Hussain Bokhari (PhD Research Scholar Sheikh Zayed Federal Postgraduate Medical)
Ayyaz A.Khat (Department of Oral Health Sciences2, Sheikh Zayed Federal Postgraduate Medical Institute, Lahore.)
The Relationship of Periodontal Disease to Cardiovascular diseases – Review of Literature
- Sofia, Bulgariat of Periodontology, Faculty of Dental Medicine, Medical University. Relationship between inflammatory peri-implant disease and the activity of periodontal disease.
- T. Maekawa, T. Abe, E. Hajishengallis, K. B. Hosur, R. A. DeAngelis, D. Ricklin, J. D. Lambris, G. Hajishengallis. Genetic and Intervention Studies Implicating Complement C3 as a Major Target for the Treatment of Periodontitis. *The Journal of Immunology*, 2014; DOI: 10.4049/jimmunol.1400569
- William G. Haynes, MBChB, MD, Department of Internal Medicine (E426 GH), Carver College of Medicine, University of Iowa, 200 Hawkins Dr, Iowa City, IA 52242. Periodontal Disease and Atherosclerosis