



Division of Diabetes Treatment and Prevention

Advancements in Diabetes Seminar Diabetes and Oral Health: What's the Connection?

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Dr. Gregory Smith:

Good afternoon, and thanks for listening in today. I'm Dr. Gregory Todd Smith. I'm the IHS National Consultant in Periodontics and after seven IHS duty stations I've been at Phoenix Indian Medical Center for the last 20 years, with over 90% of my time still in clinical care.

So the connection is that diabetes is not good for oral health, and gum disease and oral infection is not good for diabetes. Our objectives are to recognize the signs and symptoms and differences between gingival health, gingivitis, and periodontitis during dental screenings. I'm going to describe out gum disease, it can be associated with certain complications of diabetes as well as poor control. And then hopefully you'll find some tidbits of practical knowledge useful to you in your practice.

But here are some healthy gums. As we take a look, you can see the color of the gingiva is essentially the same color all the way around. That's one of the keys to you to be able to recognize changes. So, you can see it -- we actually call it coral pink. The gums fill the spaces in between the teeth. There is no bleeding when the patient brushes and flosses in this area and there is no discomfort whatsoever.

In the different periodontal diseases I'll just move our arrow off to the side. The two most common are gingivitis and periodontitis. In gingivitis, you get a reddened border, the gums tend to bleed easier when you brush and floss and it is a totally reversible state because there has not been any bone loss at this point. And by the patient flossing better, brushing better, getting any tartar, calculus build up out of there, then it's going to totally reverse back to a state of health and we'll return back to being a firm pink color like what we have through here.

In periodontitis, which is an irreversible disease, you have lost some of the bone attachment. So, what happens is there is connective tissue attachment that is lost, there is bone loss and now you have the formation of a pocket that forms around the tooth that the bacteria can hide down inside. So it's a much more involved treatment, and when we treat periodontitis then the condition doesn't return back to complete health, you still lost that attachment.

These illustrations were done by our own Dr. Tom Taylor. Move this off to the side you can see the calculus formation. We used to call it tartar. You can see the gingivitis that there has been no bone loss, just a reddening and a light swelling in the surface of the gingiva. And then in periodontitis, you can see that now you've lost some bone and then these rulers that we use are called periodontal probes, they measure these pockets. And when the pockets are deep then the floss and the toothbrush bristles can't get down into those pockets and so the disease tends to progress.

In patients with diabetes particularly when it is poorly controlled, these lesions are almost pathognomonic for patients with hyperglycemia. I just don't see this in my standard periodontitis patients. So there is an excess of inflammation and breakdown in the tissues because of an excess of collagenase and other blood vessel changes going on. So we'll see these granulomatous type tissues that form in our patients with diabetes. Also, a patient with diabetes is essentially when they're poorly



controlled, in the presence of plaque and calculus you get a much more severe reaction in the gingiva and the periodontium. So here we see plaque accumulation, there is calculus up underneath there. There is certainly been bone loss here and this is a true case of periodontitis.

A prevalence of periodontitis, looking nationally is almost 50% but of that, only 8.5% were found to be of the severe form. It's actually double that in our American Indian and Alaska Native population and that's across-the-board. In our patients with diabetes, the prevalence is even higher.

Periodontitis can be site specific. So in this patient, we're looking at a Panelipse radiograph. There is severe bone loss in the molars. Here you can see on the lower molar back through here and then up in through here, essentially all of the bone has been lost around this upper molar. However, there are still good bone levels in the premolars and in the anterior. So just because there are some loose teeth in a certain area of the mouth, it doesn't mean that that disease is generalized throughout the mouth.

One of the responses to periodontitis over time is recession. They talk about it in the westerns as being long in the tooth. This patient has had a history of periodontitis that actually the gingival tissue is really quite healthy. You can see it's the same color pretty much all the way around. So this is one of the reasons and the kind of patient that the dental clinic is going to want to keep in a recall maybe every three months, six months, nine months or twelve months depending on other factors that are going on, to be able to maintain this. This patient has been able to be maintained without any of this loss of teeth for a number of years at this point in time.

These are four different patients manifesting their periodontitis before they were diagnosed with diabetes. One on the upper left was only 23 years old. The one of the lower left was 31 years old. We often see the oral changes before the diagnosis of diabetes. All of these patients were screened with an A1C ordered by the dental department and it was done irregardless of whether they had a first-degree relative that had diabetes or whether they were obese. When we see these changes in young individuals, then we are very concerned that there are other factors going on, such as hyperglycemia.

What are some of the oral effects that we see in our patients with diabetes? Clearly, there is increased gingivitis and periodontitis. In some of our patients, there is a higher caries risk. Some of the sugar in the fluid coming up around the teeth in hyperglycemia can act as a food substrate for some of the bacteria. But if you have a well-controlled diabetic that is limiting their intake of processed carbohydrates, then the caries rate can be lower. Intraoral slow healing. Xerostomia, dry mouth is a very common finding. Just the dry mouth alone can make the individual more susceptible to caries as well as periodontitis. There are certain changes that occur in some of the salivary glands so that they don't produce as much saliva, but one of the other major components is the anti-hypertensive and the hypoglycemic medications that the patient is taking often leads to dry mouth. An interesting one is burning mouth and tongue which is one of the manifestations of the peripheral neuropathy that we see in the mouth. And then cheilosis and moniliasis are fungal infections and then whenever I have a patient present with multiple periodontal abscesses in the mouth, it screams out to me that the patient is hyperglycemic.

So the evidence is clear looking at dozens of studies. If a patient has diabetes, they are much more likely to develop periodontitis, to have it be more severe, to have it more extensive throughout the mouth and to be associated with the progression of periodontitis. Periodontitis is more prevalent in those with poor glycemic control, so I want to know what kind of control the patient has whenever they come in through the door, also when they come into our dental clinic. The good news is that when the blood sugar is under control, there doesn't seem to be a greater risk for severe periodontitis and breakdown. So we want our patients to be controlled just as much as you do.

The two-way relationship that you all have heard about is that yes, diabetes increases risk for periodontitis but the two-way relationship periodontitis does increase risk for poor glycemic control, there is increased risk of diabetes complications, and also mortality. It all has to do with the systemic

connection and bacterial access in the inflammatory response. Periodontitis like diabetes is a chronic inflammatory disease. When we take a look up through here, focusing right along the inner lining of the gum tissue called the sulcus of the pocket. There are ulcerations that occur as part of the disease process, and that allows bacteria, they're toxins such as they're lipopolysaccharide outer coating and inflammatory mediators access to the bloodstream.

So, I took this photograph and this is a patient with very, very heavy calculus on the left side, a sheet of calculus. And if you look at the outline of that, what we do is we use an ultrasonic scaler and we can actually chip and remove these large fragments of calculus away from the area. The photograph on the right is about three to five minutes after I have chipped that stuff loose and you can see the raw appearance of the gingiva that was up underneath the calculus. And then if you look along the lining of the roots, you can see the ulcerated tissue that's there. Felipe Hujuel, in 2001 estimated that in a patient with moderate to severe perio, there is an estimated 10 to 20 square centimeters of ulcerated surface, an area of tissue necrosis. How much is that? That's three to five times larger than this foot ulcer in this patient with diabetes. So we're talking about a huge amount of surface area often described as the size of a palm of the hand.

Like diabetes, periodontitis is almost always painless. So in this patient which came in with a toothache, you can see this entire back root of this molar has been exposed to the mouth from years of periodontitis and that's not why the patient came in, because there's a cavity in between the teeth on this premolar. So, gum disease is easy to ignore. We can't see these ulcerations, we can't see the local inflammation of the periodontium spreading throughout the body with systemic inflammation and so it's easy to ignore.

What's going on, Salvi described these cytokines and prostaglandins accumulating in the gum tissue at extraordinary levels and entering the circulation through these ulcerations. I like Offenbacher's statement that periodontitis is an anaerobic infection flooding the bloodstream 24 hours a day with endotoxins and mediators. So it's not just when your patients are going to the dental clinic for a cleaning, when periodontitis is present even the act of swallowing and chewing is associated with these bacteremias that are occurring.

Periodontitis through many studies has been found to be associated with increased systemic inflammation looking at these different markers of inflammation and the good news is that if you treat the periodontitis and get the disease under control, that there are measurable significant decreases in these markers of inflammation.

So, if 50% of the people have periodontitis and it's even higher in our group with diabetes, then you would think that there would be these problems throughout the body on a more regular basis. And really what's going on is it's not all oral bacteria. There are some that are more virulent than others. *Fusobacterium nucleatum*, *Porphyromonas gingivalis*, certain strains of them are excellent at getting around the host immune reaction. They're actually able to infect endocells and travel throughout the body. And *Fusobacterium* particularly is excellent at opening cell-cell junctions and blood vessels which allow these bacteria then to be able to get out of the bloodstream at distant sites and be associated with disease.

So, let's look at some of the epidemiology. Some of the best and earliest studies were on the Gila River Indian Community, south of Phoenix here and they found out that when looking at diabetic subjects, when they have periodontitis at baseline and then were followed for the next two to three years, the presence of that periodontitis was associated with worsening of A1Cs. That was found and collaborated with Collins in a non-Native American population and then Thorstensson in Scandinavia found an interesting side light in type 1 diabetics, not only if the patients had periodontitis at baseline with a follow-up of about six years, they found out that not only did the diabetes get worse but there was an increase in complications such as strokes and heart attacks.

That led to a classic study in Diabetes Care by Seremi looking also at the Pima data. This went out to a median of 11 years and they found out that the presence of periodontal disease, the baseline is a strong predictor of mortality from ischemic heart disease and diabetic nephropathy. And what made this study particularly strong was that it was a dose dependent relationship. So the worse the periodontitis, the more likely you were to die.

Shultis, looking again at the Pima data with a follow-up of up to 22 years found out that with periodontitis at baseline that that periodontitis predicted the development of overt nephropathy and end stage renal disease, and again it was in a dose dependent manner. So this predicted the incidence of the disease. All of the individuals at baseline had normal functioning kidneys.

So this is my little wheel of misfortune, we might call it. Our link looking at the top, we have a patient with diabetes. In the presence of poor PMN function, advanced glycation end-product binding and age loaded up receptors are found in tissues with periodontitis, leads to a destructive environment and inflammatory state. In the presence of these periodontal pathogens, it leads to increased periodontal destruction. But remember, I just told you that the chronic infection of periodontitis is a local as well as systemic inflammation and so you tend to get a worsening of insulin resistance increases, there is an increase in serum lipids and blood glucose and the diabetes gets worse. So that's our vicious cycle.

So if that's true, what if we were going and try to break the cycle and treat the periodontitis with the different treatment methodologies we have or say scaling and root planning and prophys and we'll talk about that. If we do that then will insulin sensitivity improve? The bottom line is that the majority of studies out there say that there is a small, 0.4%, but clinically significant improvement in A1C and diabetic control up to three months after periodontal therapy. It's not clear if and when antibiotics and other antimicrobial treatments improve the diabetes, so there was a study by Ingebritsen in 2013 that found that periodontal therapy did not improve the A1C out to six months, but they also found when they did the re-evaluation to take a look at the gum disease that about half of the sites still had bleeding going on in the gums, and so that meant the inflammation was not brought under control very well, and they also didn't use any of the local or systemic antibiotics that we use to help control this gram negative anaerobic infection.

The Cochrane Systematic Review, one of them in 2015, found that yes, there can be an effect on type 2 diabetes, it wasn't clear about type 1 diabetes, that periodontal treatment did improve the condition in type 2 diabetics looking at A1Cs, but they said that there was little high-quality evidence. So it would be nice to get some great long term studies that address some of these other issues.

Some of the terms when we treat gingivitis, we talk about a prophy or prophylaxis, a standard cleaning. In periodontitis, once you've lost that bone and you have some deeper pockets around the teeth, then we talk about deep scales or scaling and root planing. It can go to a periodontist such as myself to where we will do a flap curettage where you expose the teeth and roots to thoroughly clean them. And then when there are holes in the bone defects, we can actually do some bone grafting and regeneration. Those are more complex ways of being able to treat the periodontitis.

So let's take a look at treatments. Here we have inflamed gums, we have calculus present, we have a situation with local and systemic inflammation. We go ahead and do the cleaning. In this case, it's just a standard scaling and root planing, the patient comes back on a recall after six months and you can see now the color of the tissue, all has about that same color of that coral pink, there's no bleeding when we touch these tissues or when the patient brushes and flosses. So we've been able to establish health and there is going to be an improvement in the systemic inflammation that was associated with this periodontal inflammation.

Another case, we have some very deep pockets that are formed in between these two molars in this area with a chronic periodontal abscess and swelling in the tissues. This patient had an A1C of 11.3 and though the A1C is high and the control is not good, we can still get a very, very good response

from our cleaning. In this case, we also gave the patient systemic Doxycycline for two weeks. And then this is the one that I want you to see, this looks just awful. It looks like, "Oh my god!" Maybe we're talking about having to go full dentures here and stuff, but this is eminently treatable and this is looking at three years down the line. This case treated by a dental hygienist. Any dental hygienist can go ahead and treat this and this case has been stabilized and there is no reason that we don't have the possibility of keeping these teeth for the rest of this individual's life.

This one didn't come out so well. This is a case of mine, and patient had a high fasting blood sugar, came to us to see what they could do because her gums were getting sore. You can see that granulomatous tissue that is formed around the teeth in this area. That screams out to me that they're hyperglycemic. So we did the deep cleaning, put them on Doxycycline, and this is just at two months and we can see the shrinkage in the tissues. This is exactly what we want. That granulomatous tissue disappeared. So man, I'm thinking, "Wow! That Dr. Smith, now he's a stud, he can get this stuff under control." And then the patient disappeared for a couple of years and finally wandered in with a toothache and this is the way they look two years down the road. This patient's only 30 years old at this point in time. That granulomatous tissue has returned. There has been such severe bone loss that now our treatment plan is to take out these incisors here and then to go ahead and have to do a flipper, an acrylic partial denture while we fight on seeing how many other teeth we can save.

So again, it's absolutely critical, particularly when the blood sugar is not well-controlled, that these patients are maintained in the chronic and are brought in on a regular basis whether that would be 3 months, 6 months, 9 months, 12 months.

In treating periodontitis, we used to spend all of our time with the hand instruments up there doing all that scraping of the teeth to get the tartar off. Now there are much more effective systems out there and they utilize ultrasonic scaling where we go ahead and go and remove the calculus with the ultrasonic scaling, spend anywhere from 50% to 90% of our time with the ultrasonics and then just a little bit of hand scaling at the end to finish it up. It's a very, very effective treatment modality to try and get this gram negative infection under control. And then the other two photos, those are local antibiotic. One of them has a minocycline microsphere and the other one is a Doxycycline gel and all of those can help improve the response to care.

We really push the use of power toothbrushes, mouth rinses, toothpaste, different antiseptics because we're looking for bullets to help get this infection and inflammation under control. There are toothpastes out there that are approved for anti-plaque, anti-gingivitis treatment and there are many mouth rinses that have been approved by the ADA now, that go ahead and help control the plaque forming at the gum line and the conversion of these plaque that form at the gum line into the gram negative anaerobes that can gain hold and cause the progression of the disease.

Home care is critical. I mean this is the self-efficacy that we need to push. This is what you as healthcare workers should be pushing at the same time that we are, that they are at risk for breakdown and they have to do things more than others may. They may have a brother or a best friend or a partner that can get away without flossing or cleaning in between the teeth. And we just point it out that, "No, they just can't afford to do that." And then to help them understand, we drive home the bottom line point, is that diabetes increases the risk for severe gum disease and gum disease can make it harder to control the blood sugar. So these are all different tools that you can use to be able to clean in the interproximal area, the area between the roots of the teeth where usually that bone destruction starts.

We're changing course here a little bit in that there has been some studies off an insurance data where periodontal treatment can decrease medical cost for patients with diabetes. What that means, the first one was with Aetna patients and when patients were first enrolled into Aetna who were going to receive dental care, then those that received care for periodontitis, they noticed that there was a decrease in cost for patients with diabetes, coronary artery disease, and stroke. In the other studies looking at the

one by Mosen in particular, regular dental cleanings reduce hospitalizations and ER visits for diabetes specific medical care. That was on patients that were members of Kaiser Permanente. And then the Jeffcoat study published in the American Journal of Preventive Medicine found out that completing periodontal therapy and recalls, reduced hospitalizations by about 40% and \$2,840 of annual reduction in patients with diabetes. This was a group over one million enrollees that had high mark medical insurance as well as United Concordia Dental.

So it looks like there is a potential of a decreasing cost and an improvement in health by providing periodontal therapy. In this last Jeffcoat study, they received a series of deep cleanings and then were put on recall and that was compared to others who did not complete their cleanings and their recalls. So this data is insurance data. Insurance data is not anywhere near as high quality as a randomized clinical trial et cetera but if it doesn't mean anything, then why would the majority of these major carriers then increase their dental coverage. So now, Aetna, Cigna, Blue Cross Blue Shield, Delta Dental, United Healthcare and United Concordia, all of them have increased their benefits that individuals can get to be able to make sure that they get in and get their teeth cleaned to establish a healthy mouth and this is oftentimes without any change or increase towards that annual cap that they have to spend in that maximum amount. It won't even count against that.

So the medical guidelines say that you as a healthcare worker should be inquiring about regular oral health checkups, how often are these individuals coming in? You need to inquire at least annually for symptoms of gum disease and to seek treatment at present. And we need to remind them that daily home care is a normal part of their diabetes self-management. And then educate them on the relationship between diabetes and gum disease, very important. You guys have a job in doing this, in making sure that they understand the need and the need to know your referral process to your dental clinic.

I've done talks for different medical staffs out on the road like down at Tucson for instance, and at the end of the discussion, it comes on out, "Well yeah, you know we want to get our patients over to dental. The dental is overwhelmed. We can't get the patients in." And then dental will go, "Well, yeah, we have a mechanism and this is what it is and whatever." So know what you have going on at your clinic.

So as just an example. At PIMC, then any patient with a toothache, we have acute care clinic every day, Monday through Friday and they can come into the morning and be seen for that. But if they want a dental exam, then what we're expecting is the healthcare provider over in our primary care clinic to at least take a tongue blade, do a quick oral screening in the mouth and then ask them when was their last dental exam, when's the last time they came into dental for a cleaning? Take a look, and see if there are swollen gums in the presence of disease, if the patient is having any difficulties. If that occurs, then they complete this golden ticket. Now we took this golden ticket, it was actually a referral card to Vision and we just put a stamp on the back so what we can then track through an Excel spreadsheet, patients coming on over to dental. And then if we can't provide them an exam on the spot then they are put at the top of the list to be able to get a dental exam and come in and then receive a comprehensive dental care to establish a healthy mouth for them.

So in summary, chronic inflammation is the link between many illnesses including diabetes and periodontitis. Diabetes increases risk for perio and perio increases risk for diabetic complications, particularly kidney disease and atherosclerotic cardiovascular disease and poor metabolic control. Periodontal treatment reduces the cumulative systemic pathogen and inflammatory burden throughout the body and the consequences of undertreating the gum disease could be more than just the loss of a few teeth.

And then we do have some stuff upon the diabetes web page. We have an oral health best practice. There's a video up there and certain clinical tools for you to be able to utilize. The video, shows how to do intraoral exam in about a minute and a half using a tongue blade without having to glove. And I think that that's valuable. That certainly we have a periodontal initiative in the Indian Health Service

over the last few years. And the statement that we had associated with that is overall health begins with periodontal health that you need to have a healthy mouth to be overall healthy. And there are difficult diseases, diabetes and periodontitis, and the successful treatment of both require intensive intervention and an active maintenance, whether patients are continuing to come in and then patients have to develop a lifestyle modification to be able to deal with some of the consequences of the disease.

So that's all I've got and I am more than willing to start answering some questions to see if we can clarify some of these issues I brought up.

Should the oral rinses not include the whitening chemicals? And I would have to say yes, that a lot of our patients have trouble with whitening formulas. And the whitening is not therapeutic in trying to treat the periodontitis or gingivitis. Now usually the whitening components are put into toothpaste, but they're not whitening usually because of the chemicals. They're whitening because they put more glass, more silica in the toothpaste that makes them more abrasive and then the teeth become sensitive. So we're mainly looking for an ADA approved anti-plaque, anti-gingivitis agent to help in conjunction with the mechanical removal of the plaque that the patients can be doing on an everyday basis.

Second question, in your experience have you seen a reduction in the A1C when you treat the periodontal disease? Absolutely! We even did -- it was an unpublished study, but working with Bill -- Dr. Bill Knowler and Dr. Jeff Curtiss, we did an analysis of what happens when you truly eliminate the infection? And so we took a subpopulation of our diabetic patients that we were tracking. And we took the ones -- because I think it came to 3%, that had such severe periodontitis that they had to have their teeth removed. So we got A1Cs about up to two months prior to the extractions and then four to six months after the extractions and we found an A1C decrease of 1.2%. And when you do that, that's going to tend to keep the reduction and the A1C more long term because what happens with periodontitis as you saw in that one patient particularly, when you do that deep cleaning, if you don't keep them coming back in, then that infection tends to grab hold again over time and so that's the reason for the recalls. And so it's hard to get the -- just like you don't really cure diabetes, it's tough to cure periodontitis. You try and maintain and establish health and then maintain it with recalls.

Thoughts on Chlorhexidine use in scaling and root planing, one presentation have first molars removed and second molar shifting forward, poor traumatic bite. Sorry, that one jumped on me, let me bring this up a little bit. Thoughts on Chlorhexidine after scaling and root planing, inhibits cellular healing and reattachment. I do have strong thoughts on Chlorhexidine. For instance when you're using it as a mouth rinse, it's not getting down deep into the pockets. So you are not going to have an effect on fibroblasts and things like that. But there are some strong side effects with Chlorhexidine in that the teeth stain and the patients actually form more calculus along the gum line. So I use it in surgeries where the patient can't brush and floss afterwards and there are sutures present. But I'm only putting the patient on it during initial therapy for two weeks and then after surgery. I do not put my patients on Chlorhexidine long term because of the disadvantages and the side effects of using it. And I don't use it when I do my ultrasonic scaling as part of my scaling and root planing, I just use distilled water or our reverse osmosis water that we have as an irrigant because visualization is better. You don't have to worry about the taste, staining of clothes, things like that.

One of my first patient, this is another question. One of my first patients presented with molar only bone loss, also had first molars removed and second molars shifting forward. Traumatic and by chicken and egg, I'm not sure, but when you get an infected tooth and it's chronic infection with a chronic periodontitis and all the bacteria ending up into the bloodstream, it's just not a healthy situation for anybody, particularly our patients with diabetes. So if we're going to get out the molar in this case, then there are ways like bridges, different types of splints to help hold the molar and keep it from bringing and rotating down into that place. But a lot of our patients don't get that in public health programs. For instance at PIMC, if we extract a first molar due to periodontitis, we'll do everything we

can to maintain the second molar to be able to keep as many functioning teeth together to chew with, but it's still not a perfect situation, and so that's why we try and go out of our way to save them because yes, the bite can collapse, the teeth will shift and then it can make it harder to control the periodontitis.

For a patient requesting homeopathic toothpaste, mouth rinse, and foods and beverages, do I have any recommendations? Tom's of Maine has some toothpaste. If the patient has rampant caries or has a caries problem, I'm going to steer them into a fluoride containing mouth rinse and toothpaste. I think that's very, very important. Otherwise, there are mouth rinses that utilize water instead of alcohol and because of the dry mouth, it's sometimes important to be able to pick one of those. There is a product coming out of New York called Gum Tonic that has things like Echinacea and stuff, but there haven't been controlled studies to show their efficacy over time.

What do I think of perio protect? Perio trade products for adjustments in treating a periodontal disease, and they do use a hydrogen peroxide kind of formulation. It is a treatment methodology, as an antimicrobial that the patient can wear at night. They need to wear it for long periods during days for like 20 minutes at a time. There haven't been the stamps of the American Academy of Perio, is that there are not really good randomized clinical trials or at least there's very few of them. So I'm not using it at this point, but I've seen anecdotal reports and if you have a motivated patient, then there doesn't seem to be any downside to it whatsoever.

Do I see a lot of tooth absorption with diabetes? No, I do not tend to see roots that get eaten up and replaced by bone, what we call resorption. I do not tend to see that any more in diabetics versus non-diabetics and it's pretty rare. It's usually associated with trauma to a tooth or certain antimicrobials, bleaches that are used during root canal therapy, things like that or perforations in the root.

How does infection spread? And to what other area of the bodies tend to be affected mostly as any new rules on other body surgery and need dental cleaning before? If I get that right, what happens is there are links now that they're finding between the periodontal organisms getting into the bloodstream and increasing risk for, not only head, neck squamous cell carcinoma, but also carcinoma of the colon, of the lung, of the pancreas. And so what they do is this hematogenous spread through the blood stream and then certain organisms like that fusobacterium allow these organisms to be able to gain access to the actual solid organs and set up an environment of inflammation and potential cancer. Oral trepannings, Spiro cysts have been found in the brain area and associated with impairment of cognitive thought and Alzheimer's disease. Certainly atherosclerotic cardiovascular disease, they do endarterectomies and take a look at the lining of these vessels in the aorta and the carotid and the coronary arteries and they're finding half of the plaques are associated and have periodontal organisms that are embedded in the plaques. So there are all sorts of strong links to the importance of getting this stuff under control.

So because of that, now somebody is going to have a mesh placed during a hernia operation. They come to us at PIMC to get their oral health squared away. Certainly the standard of care, if they're getting a kidney transplant or they are getting a hip or knee transplant, then physicians are sending their patients to us to make sure we get them cleared orally, get them a healthy mouth before that procedure starts.

How long does it take to scale the teeth with heavy calculus on them? Well one is -- well that's a great question. All right, when the calculus is heavy, we will often do it in quadrants of the mouth. Since I have an assistant that works with me, I can do a half mouth in an hour. But it takes me the entire hour and in some patients, that haven't been clean for 15, 20 years, the calculus can be on there like cement. So we will go ahead and break the mouth into either a quadrants or we will do it as an upper right and then lower right then upper left then the lower left are over four appointments. Or we'll go ahead and do all of the upper teeth to the upper left canine and then do the upper left posterior teeth and the lower left quadrant down to the central incisors. You can split it up anyway you want depending on how tenacious is the word that we use for the calculus that doesn't want to come off.

But routinely speaking, a trained dental hygienist that has done deep cleanings can do one to two quadrants or a quarter or a half of the mouth in one hour. Benefit of mouth rinses without alcohols opposed to mouth rinses with alcohol, I would just say the drying action. I don't like Xerostomia, but one of the mouth rinses with the essential oils, those are alcohol based and the alcohol is also an antimicrobial and so in conjunction with the essential oils seems to be somewhat more effective than the one that it is a water-based. But in a lot of our populations, if I can, I'm going to usually recommend one without the alcohol.

And then since there are few periodontists in the IHS, can I share with the group. You may have a success in non-surgical periodontal therapy and also the limitations and the need for a referral. So the bottom line is that 90% to 95% of these patients can be treated by your dental hygienist doing these deep cleanings, scaling and root planing and then providing recall. But every now and then, you're going to have a patient that when they come on back, you're still going to see that bleeding. There's going to be deep pockets and at that point in time, that patient should be apprised that the clinic has done everything they can within their scope of services and that they need to be seen by a specialist. And that that may have to be paid for out of pocket, but they have to be notified of that. We have only three periodontists in the entire Indian Health Service at this point in time and there's not much hope to add on another three or whatever it would take. So we need to utilize the private sector through a referred based care and stuff like that if that's possible in the clinic. And if it's not, we just need to recommend that they get to a periodontal specialist where they could get bone grafts, regeneration. They could be monitored differently and all sorts of different factors come into play.

And some questions on lip bumper devices. Anytime we're using lip bumper devices, we're looking at orthodontics and the treatment at TMJ and I really can't speak on that on periodontitis and gingivitis.

And then what do I think about coconut oil and oil pulling? It's an Ayurvedic medicine at India for about 3,000 years. It's very time-consuming. Nothing has ever been shown to be that it wouldn't be healthy, but we do not have the randomized clinical trials to show that by putting this extensive number of minutes on a daily basis to doing that, that it is better than some of our mouth rinses, toothpaste and mechanical control through brushing and interproximal cleaning.

Jan Frederick:

You made it through all the questions Dr. Smith, thank you so much. I know you can't hear all of us, but we're all clapping and feeling very fortunate to have you do your presentation for us today as a dental specialist and as the IHS National Consultant for Periodontics. We're really honored to have had you sharing your significant expertise and your years of experience with caring for patients with diabetes or whether it's diagnosed or not with us today.