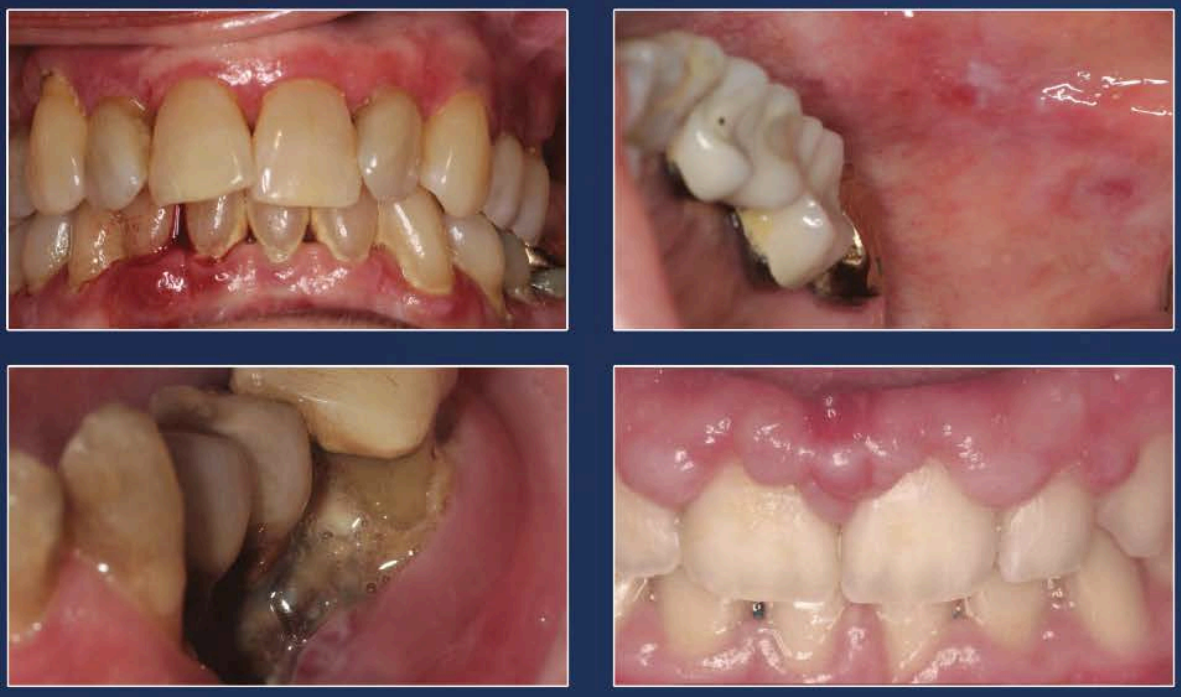
A CLINICIAN'S GUIDE

DIAGNOSING AND TREATING ORAL DISEASES AND OROFACIAL PAIN

INCLUDING MEDICATIONS AND MEDICAL GUIDELINES



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A Clinician's Guide

Diagnosing and Treating Oral Diseases and Orofacial Pain

Including Medications and Medical Guidelines

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Laser Periodontics
and Implants

"Saving Lives by Saving Smiles"

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"Saving Lives by Saving Smiles"

Acknowledgements

This book would not have been possible without the incredible support and advice of our wife and mother, Brenda McCawley, and Ann Nye West, our brilliant editor and publisher. They were both amazingly patient with our numerous rewrites and additions.

Thanks also goes to the many great reference sources in this book, including Richard Wynn, Gordon Christensen, Peter Jacobsen, Robert Marx, Michael Siegel, and Jason Goodchild. (See References on page 77.) We highly recommend these books for further information on the subjects discussed in this book. While we used material from these sources, we have rewritten and summarized almost all of the material so that the responsibility for the book's content is ours.

Our patients, referring dentists and team members also helped and inspired us by their questions and their advice about how best to diagnose and treat oral diseases and orofacial pain.

Drs. Tom and Mark McCawley

"This easy-to-use encyclopedia of contemporary information on diagnostic and treatment guidelines for oral diseases and orofacial pain is a valuable addition to the reference library of all clinicians. Especially interesting and important is the chapter on avoiding errors in these situations."

Robert Eskow, Past President, American Academy of Oral Medicine
Clinical Professor, New York University College of Dentistry
Livingston, NJ

"Drs. Tom and Mark McCawley are two of the most forward thinking and most progressive periodontists in the US, among the first to embrace the concept that periodontal disease is an infection and should be treated as such. Their practice represents the highest standard of excellence, and so does this book. It provides immensely practical information to clinicians in diagnosing and treating oral diseases and orofacial pain. I highly recommend it!"

I. Stephen Brown, DDS., FACD, Professor of Periodontics
University of Pennsylvania and Temple University
Director, Albert Einstein Implant Center
Philadelphia, PA

Introduction - The Purpose of This Guide

The purpose of this reference guide is to assist clinicians, team members, and their patients, by providing answers to the most common questions about the treatment of oral diseases and orofacial pain...a kind of concise "Wikipedia" of answers to sometimes perplexing questions about treatment, including managing the medications and medical conditions involved in their treatment. We want to improve patient care by providing up-to-date information to assist appropriate treatment and **prevent errors. (See bolding in red that highlights these potential errors throughout the book,** and Errors to Avoid in Diagnosing and Treating Oral Diseases and Orofacial Pain on page 80 in the Appendix.)

However, the primary purpose of this reference guide is a further expression of our mission to make the biggest possible contribution to our dental colleagues and their patients as expressed in our mission statement: "Saving Lives by Saving Smiles."

For questions not answered in this book, please feel free to call us at the office at 954-522-3228 or email us at info@mccawley.com.

Yours in Better Total Health,
Drs. Tom and Mark McCawley

"This book by two outstanding periodontists is a brilliant guide to diagnosing and treating oral diseases and orofacial pain that will prove invaluable to clinicians."

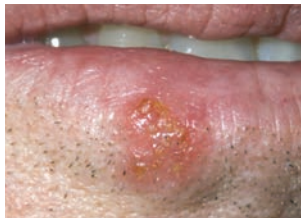
Dr. Ken Versman, Periodontist
Denver, Colorado

Diagnosing and Treating Oral Diseases

Recurrent Herpes Simplex and Aphthous Ulcers

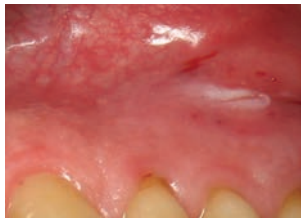
If the sore is on the lip, it is caused by a **herpes virus infection** and is contagious. These are commonly called "cold sores" or "fever blisters." Patients should avoid touching them and then touching their eyes since the herpes virus can spread to the eye and then is much more difficult to treat.

Treatment: Over the counter Abreva Cream applied five times a day will shorten their duration. Over-the-counter (OTC) Carmex lip balm applied at the first tingle will help the pain. Valtrex can be prescribed — two grams in the morning and two grams in the evening — taken at the first sign of an outbreak. Zovirax or Denavir ointments can also be prescribed, but are very expensive ($800-$900 per tube), and often not covered by medical insurance. A local compounding pharmacist can make up a much less expensive generic version of Zovirax (5.5% acyclovir



Herpes virus infection occurs on the lip and is contagious. Primary herpes infection occurs inside the mouth. (See next page for a DNA diagnosis report for herpes simplex virus.)

The most common sore **inside the mouth** is an **aphthous ulcer**, commonly called a "canker sore." These are not viral, occur on movable tissue like the tongue or cheeks, and are not contagious. The cause is unknown, and they tend to recur.



Recurrent aphthous ulcers occur on moveable oral mucosa inside the mouth and are not contagious.

Treatment for individual sores includes application of OTC Zilactin B, Canker-X, Orajel with

benzocaine, or prescription Orabase with the steriod Kenalog. These coat and numb the lesion. The prescription steroid ointment Lidex is another possibility. In office, Debacterol can be applied which will cauterize the lesion and reduce the pain.

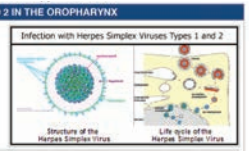
For multiple canker sores, treatment with the so-called "Magic Mouthwash" containing Benadryl, Maalox, and viscous xylocaine will reduce pain dramatically. For larger outbreaks, the steroid dexamethasone can be added to the mixture. These mixtures are compounded by a local pharmacist. Alternatively, prescription dexamethasone elixir alone, 0.5 mg/ml, can be used as a rinse – one tablespoon for two minutes four times a day – or OTC Rincinol can be used as a rinse to coat the lesions.

Oral DNA Test for Herpes Simplex Virus Types 1 and 2

This positive test in an 18-year-old male with fever and painful ulcers throughout the mouth and throat helps confirm the diagnosis of primary herpes infection. (See treatment recommendations on page 12.)

MOLECULAR DETECTION OF HERPES SIMPLEX VIRUS (HSV) TYPES 1 AND 2 IN THE OROPHARYNX

Test Results	
HSV Type 1	Positive
HSV Type 2	Positive



Interpretation:

This sample is positive for HSV-1 and HSV-2 DNA. See comments.

Comments:

- Significance: HSV-1 and HSV-2 in the oropharyngeal tract is transmitted by direct contact with body fluids or lesions of an infected individual. The current positive result demonstrates evidence of HSV-1 and HSV-2 infection and the presence of shed virus in the tested oral rinse sample.

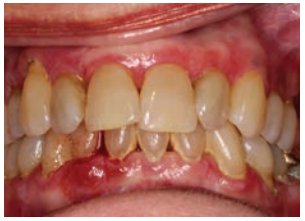
- Risk: Oropharyngeal herpes (inclusive of herpes labialis, herpes stomatitis, herpes glossitis, herpes pharyngitis) are common infections of the ororespiratory tract. Such conditions are most frequently caused by primary or recurrent shedding of herpes simplex virus type 1 (HSV-1), but numerous reports of herpes simplex virus type 2 (HSV-2) infection are described. Infections by both types of HSV are the result of transmission by person-to-person contact, including kissing, oral sex, and other means to transmit the virus from vesicular or ulcerative lesions. Following a primary infection, the herpes viruses usually becomes latent in the nerve tissues, principally in the root of the trigeminal ganglion. These infections frequently recur causing small, painful vesicles commonly called cold sores or fever blisters. Herpes infections may also lead to severe and dangerous consequences: if they occur in or near the eye, where herpes keratitis is a leading cause of blindness. Other complications of oral herpes most typically cause "aphthous ulcers" or canker sores, but may rarely include involvement of the central nervous system (encephalitis) or a form of hepatitis. In each of those conditions, herpes infections may be life threatening and should be met with the evaluation of conditions that predispose a person to such serious outcomes including reasons for a weakened immune system, undetected malignant disease or other viral diseases such as HIV/AIDS.

- Consider: Currently, there are no standard recommendations for the use of tests for HSV infections in either the ororespiratory or genital tracts. However, molecular testing for HSV-1 and HSV-2 for samples from the oropharynx can confirm a clinical impression of HSV infection, or as an adjunct to cytologic assessment of a vesicular or ulcerative lesion. Mild outbreaks of herpes simplex lesions typically require no treatment, but may require management of localized pain and or fever. Severe infections, and in particular in immunocompromised persons, may require treatment with an antiviral agent. Oral antiviral drugs include acyclovir (Zovirax), valacyclovir (Valtrex) and famciclovir (Famvir). Topical acyclovir or penciclovir (Denavir) creams may shorten attacks of recurrent HSV-1 if it is applied early, usually before clinically obvious lesions. Specific recommendations for the frequency and management consequence of these DNA based tests can be reviewed at http://www.cdc.gov/mmwr/pdf/rr/rr6403.pdf

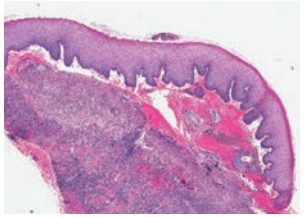
Generalized Painful Ulcerations: Pemphigoid, Lichen Planus, Primary Herpes, and Pemphigus

More **generalized** or occasionally localized, blood-filled erosive lesions with the tissue sloughing (Nikolsky's sign) sometimes form on the gums and cheeks. These are usually caused by **Desquamative Gingivitis (Benign Mucous Membrane Pemphigoid).** Generalized or localized painful erosive lesions on the cheeks or tongue characterized by **white striations** are caused by **Erosive Lichen Planus.** These are both considered auto-immune diseases, and treatment is palliative, not curative.

Treatment: An anti-oxidant gel called PerioSciences AO ProVantage Antioxidant Gel can be applied five times a day for mild cases. For more severe cases, a steroid gel called clobetasol 0.05% (15 gm tube) can be prescribed and applied with a Q-tip twice daily. Alternatively, dexamethasone elixir 0.5 mg/ml (12 oz. bottle) can be used as a rinse, one tablespoon for two minutes four times per day. In severe cases, this rinse can be used in combination with clobetasol gel. For desquamative gingivitis, doxycycline 100 mg once a day for 30 days has been found very useful. These conditions are a sometimes-painful annoyance, but are not serious, and recurrence is common. If they are not painful, no treatment is needed.



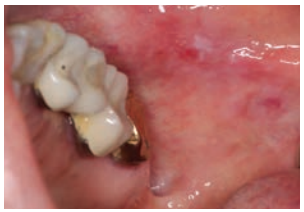
Desquamative Gingivitis produces generalized bloodfilled erosive lesions with tissue sloughing (Nikolsky's sign).



Histological section reveals separation of the epithelium due to lack of adhesion along the basement membrane.

Primary Herpes Infection will sometimes occur, most often in children, but occasionally in adults. This infection is characterized by **very painful ulcers throughout the mouth**, including the gums and throat. It is often accompanied by fever, swollen lymph nodes, difficulty eating and fatigue. The outbreak usually lasts from seven to 14 days and then goes away on its own. It is a painful, but not serious condition. It is contagious during the outbreak. Diagnosis can often be confirmed by an OralDNA Laboratory culture for the herpes virus. (See page 10 for a DNA diagnosis report for herpes simplex virus)

Treatment: Prescription Valtrex 500 mg two caplets twice daily for five days. Treatment with the so-called "Magic Mouthwash" containing Benadryl, Maalox and viscous xylocaine will reduce pain dramatically. Chloraseptic spray can numb the tissue before eating.



Erosive lichen planus occurs on the cheeks or tongue and is characterized by white striations.

Pemphigus vulgaris causes **more serious**, diffuse, very painful ulcerations throughout the mouth, and on the skin, and requires a special immunofluorescent biopsy to diagnose. Fifty percent of patients with this condition present first with oral lesions before the onset of skin lesions resembling a burn.

Treatment: This is a serious condition and requires management by a dermatologist, often with systemic steroids.

Allergic reactions can sometimes cause generalized epithelial sloughing. The most common culprits are cinnamon or sodium lauryl sulphate in toothpastes. Switching to Biotene toothpaste may help.

Rarely, patients experience an allergic reaction to Listerine. **Chlorhexidine occasionally causes an allergic reaction** which sometimes can even trigger anaphylaxis that has resulted in a few deaths.

Candidiasis and Angular Cheilitis

Sores on the corners of the mouth are called **Angular Cheilitis** and cause pain when opening and closing the mouth. These sores are usually caused by a yeast infection (Candida albicans) secondary to wear or loss of teeth. The loss of teeth in turn causes overclosure of the mouth, creating a crease at the corners of the mouth where saliva accumulates.

Treatment: Patients should avoid licking the area with their tongue. They should keep the corners of their mouth dry by dabbing frequently with a facial tissue. Prescription Mycolog-II ointment is then applied four times a day until healing occurs. Alternatively, OTC Monistat 7 vaginal cream can be applied four times a day.

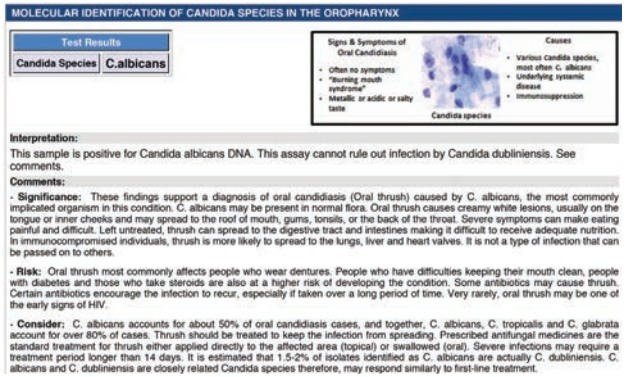
Inside the mouth, a yeast infection is usually characterized by white patches which often can be scraped off. Occasionally, it shows up as red patches, or as a black, hairy tongue. This infection is usually caused by prolonged antibiotic use, steroid inhalants, or a lowered immune system.

If uncertain of the diagnosis, an OralDNA saliva analysis can be performed to identify the specific candida species involved and aid treatment. (See the next page for a sample report.) Candidiasis can also be diagnosed by analyzing a smear from the area in question on a phase contrast microscope.

Treatment: Mycelex troche (clotrimazole) 10mg allowed to dissolve in the mouth five times a day for 14 days. An alternative is Nystatin oral suspension (100,000 units/ml – dispense 240ml), take one teaspoon and swish for two minutes, then swallow, four times a day. For more severe yeast infections, Diflucan 100 mg can be prescribed – 15 tablets, take two tablets, then one tablet daily for 13 days. This can also be useful in Angular Cheilitis that is resistant to topical treatment.

DNA Test for Candidiasis

This report confirms the suspected diagnosis of oral candidiasis. Recommended treatment is described on the previous page.



MOLECULAR IDENTIFICATION OF CANDIDA SPECIES IN THE OROPHARYNX

Test Results	
Candida Species	C.albicans

Signs & Symptoms of Oral Candidiasis
- Often no symptoms
- "Burning mouth syndrome"
- Metallic or acidic or salty taste

Causes
- Various Candida species, most often C. albicans
- Underlying systemic disease
- Immunosuppression

Candida species

Interpretation:

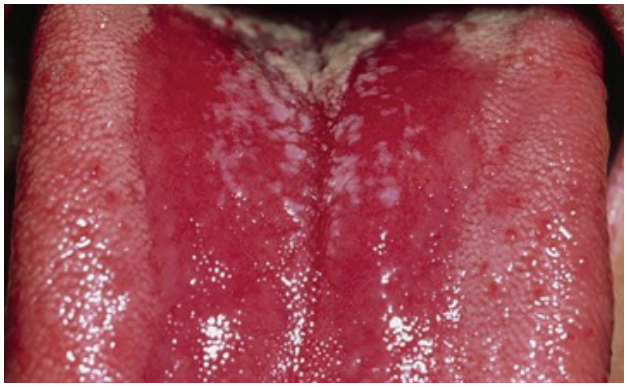
This sample is positive for Candida albicans DNA. This assay cannot rule out infection by Candida dubliniensis. See comments.

Comments:

- **Significance:** These findings support a diagnosis of oral candidiasis (Oral thrush) caused by C. albicans, the most commonly implicated organism in this condition. C. albicans may be present in normal flora. Oral thrush causes creamy white lesions, usually on the tongue or inner cheeks and may spread to the roof of mouth, gums, tonsils, or the back of the throat. Severe symptoms can make eating painful and difficult. Left untreated, thrush can spread to the digestive tract and intestines making it difficult to receive adequate nutrition. In immunocompromised individuals, thrush is more likely to spread to the lungs, liver and heart valves. It is not a type of infection that can be passed on to others.

- **Risk:** Oral thrush most commonly affects people who wear dentures. People who have difficulties keeping their mouth clean, people with diabetes and those who take steroids are also at a higher risk of developing the condition. Some antibiotics may cause thrush. Certain antibiotics encourage the infection to recur, especially if taken over a long period of time. Very rarely, oral thrush may be one of the early signs of HIV.

- **Consider:** C. albicans accounts for about 50% of oral candidiasis cases, and together, C. albicans, C. tropicalis and C. glabrata account for over 80% of cases. Thrush should be treated to keep the infection from spreading. Prescribed antifungal medicines are the standard treatment for thrush either applied directly to the affected area (topical) or swallowed (oral). Severe infections may require a treatment period longer than 14 days. It is estimated that 1.5-2% of isolates identified as C. albicans are actually C. dubliniensis. C. albicans and C. dubliniensis are closely related Candida species therefore, may respond similarly to first-line treatment.



Candidiasis on the tongue in a patient taking prolonged antibiotics. These white candida growths can often be scraped off, sometimes leaving a bleeding surface to aid in diagnosis.

Oral Cancer

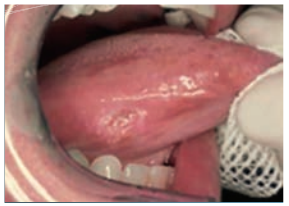
Lesions which may be oral cancer include a sore in the mouth that doesn't heal, a lump that does not go away, a white patch anywhere in the mouth, difficulty swallowing, or a swollen lymph node in the neck. **The gold standard is to biopsy any suspicious lesion.** Sometimes, a special fluorescent light can be used to help screen for cancer and determine if a biopsy is indicated.

Risk factors for oral cancer are smoking, excessive alcohol consumption, and especially, chewing tobacco or snuff. Chewing tobacco increases the risk of oral cancer by a staggering 50 times. Stopping any of these habits will substantially reduce the risk of oral cancer.

An emerging risk factor is Human Papillomavirus (HPV 16/18) infection, a sexually transmitted virus which is causing throat cancer in younger people. Testing positive for HPV 16/18 means you are at greater risk of throat cancer and need to be monitored more closely. **These cancers occur most commonly on the base of the tongue or in the throat,** so these areas need to be examined thoroughly during an oral cancer examination. A simple salivary DNA test (OraRisk HPV 16/18 HR) can determine if a patient is HPV positive. (See the next page for a sample test report.) The Centers for Disease Control recommends that all boys and girls between the ages of 12 and 26 be vaccinated against HPV 16/18, ideally prior to sexual exposure to the virus.

Oral melanomas occur most commonly on the palate. They have pigment color variation and are asymmetric. They tend to metastasize early which results in a poor prognosis.

Oral cancer kills more people annually than cervical or prostate cancer. Oral cancer has only a five percent survival rate at five years. If found early, survival increases dramatically, so any suspicious lesion should be examined, and possibly biopsied, as soon as noticed.



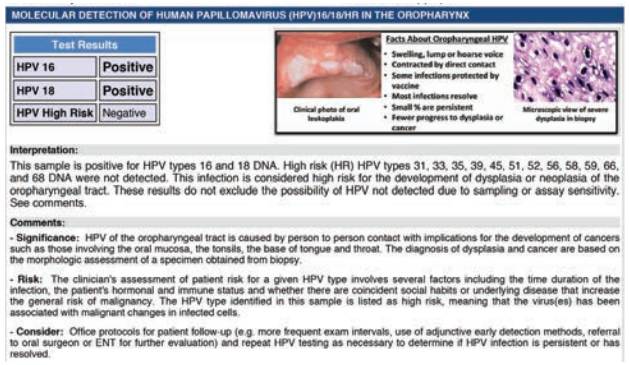
Oral cancer occurs most commonly on the posterior of the tongue, the floor of the mouth, and on the lip. ***Early diagnosis is critical.***

DNA Test for Human Papilloma Virus (HPV 16/18)

This HPV report reveals a probable high risk for developing oral dysplasia or cancer. This sexually active male will require much closer monitoring for early cancers. Repeat HPV testing is also indicated to see if the infection is persistent or has resolved.

*"No treatment is recommended for **subclinical HPV** infection in the absence of dysplasia or neoplasia. The transient nature of most HPV infections suggests conservative treatment because they usually regress spontaneously."*

The Medical Letter on Drugs, July 3, 2017



MOLECULAR DETECTION OF HUMAN PAPILLOMAVIRUS (HPV)16/18/HR IN THE OROPHARYNX

Test Results	
HPV 16	Positive
HPV 18	Positive
HPV High Risk	Negative

Facts About Oropharyngeal HPV

- Swelling, lump or hoarse voice
- Contracted by direct contact
- Some infections protected by vaccine
- Most infections resolve
- Small % are persistent
- Fewer progress to dysplasia or cancer

Clinical photo of oral leukoplakia

Microscopic view of severe dysplasia in biopsy

Interpretation:

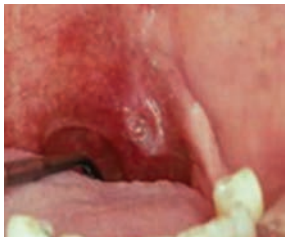
This sample is positive for HPV types 16 and 18 DNA. High risk (HR) HPV types 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66, and 68 DNA were not detected. This infection is considered high risk for the development of dysplasia or neoplasia of the oropharyngeal tract. These results do not exclude the possibility of HPV not detected due to sampling or assay sensitivity. See comments.

Comments:

- **Significance:** HPV of the oropharyngeal tract is caused by person to person contact with implications for the development of cancers such as those involving the oral mucosa, the tonsils, the base of tongue and throat. The diagnosis of dysplasia and cancer are based on the morphologic assessment of a specimen obtained from biopsy.

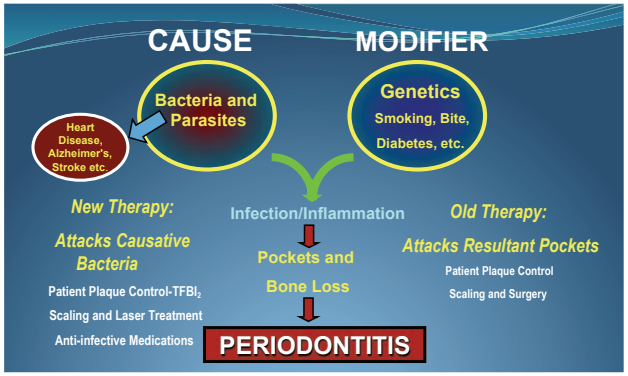
- **Risk:** The clinician's assessment of patient risk for a given HPV type involves several factors including the time duration of the infection, the patient's hormonal and immune status and whether there are coincident social habits or underlying disease that increase the general risk of malignancy. The HPV type identified in this sample is listed as high risk, meaning that the virus(es) has been associated with malignant changes in infected cells.

- **Consider:** Office protocols for patient follow-up (e.g. more frequent exam intervals, use of adjunctive early detection methods, referral to oral surgeon or ENT for further evaluation) and repeat HPV testing as necessary to determine if HPV infection is persistent or has resolved.



Throat cancer in a patient that tested HPV positive. These cancers are increasing and occur most commonly on the base of the tongue or in the throat

Periodontitis: Causes and Treatment



This diagram shows how bacteria and parasites, modified by genetics and other factors, combine to cause infection and inflammation. This process in turn results in pockets and bone loss – periodontitis. ***The best way to control and/or eliminate periodontal infection and save patients' smiles is to focus on treating the bacterial and parasitic cause of periodontal disease, not just the resultant pockets.*** *New therapies such as special patient plaque control methods, proven laser treatments, and targeted anti-infective medications are the most effective.*

These therapies may also save the health of our patients. The bacteria and parasites which cause periodontal disease contribute to an increased incidence of heart disease, Alzheimer's disease, stroke, pancreatic cancer, rheumatoid arthritis and many other systemic diseases.

Four Steps to Eliminate Periodontal Disease

First Step

Provide a bacterial and parasitic diagnosis by using the microscope, clinical signs, and sometimes a culture.

Second Step

Eliminate the infection with the use of scaling, the laser, disinfectant products and specially selected antibiotics based on an individualized microbial diagnosis.

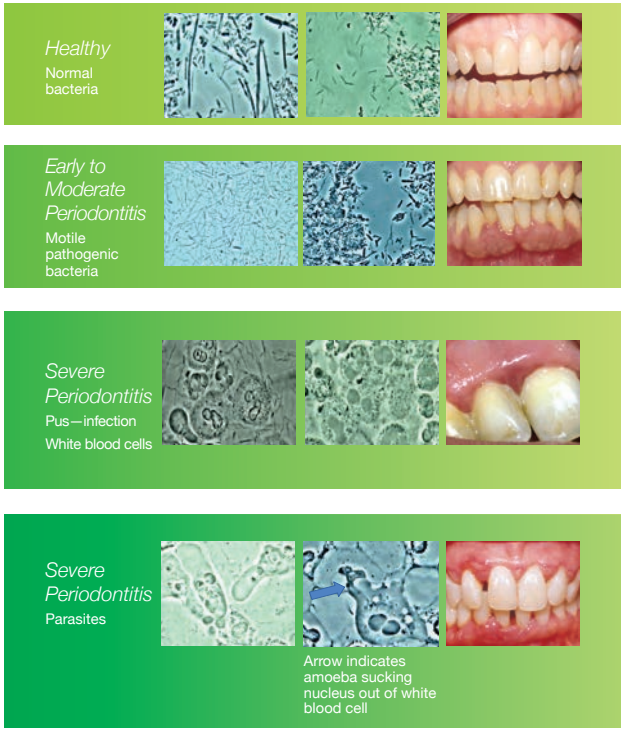
Third Step

Look after your gums and teeth with good plaque control and antiseptics.

Fourth Step

Avoid reinfection from others, pets, food and water, especially in the Caribbean, and continue bacterial and parasitic control.

Microscopic Slides of Bacteria Associated with Various Periodontal Infections and Their Clinical Manifestations

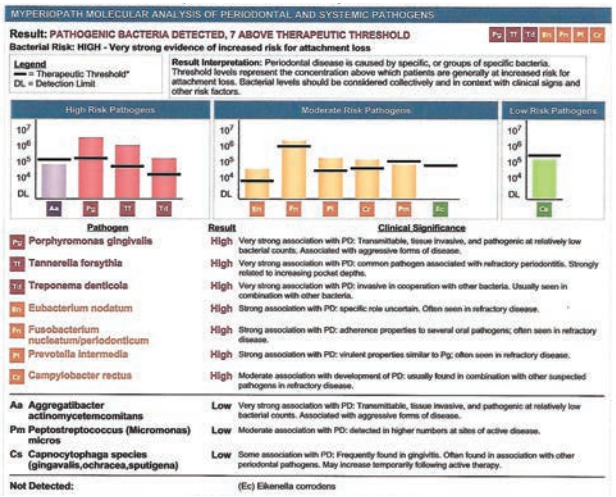


Courtesy of Dr. Mark Bonner

Oral amoebas are one cause of periodontal disease. They also infect the tonsils and lungs. They eat 100 white blood cells in their 21-day life by sucking out the nucleus and releasing toxic enzymes. (See slide of amoeba sucking out white blood cell nucleus immediately above.)

DNA Analysis of Periodontal Pathogens

A 28-year-old female with very high levels of seven periodontal pathogens. This helps explain her very severe periodontal disease at a young age and helps with antibiotic selection. (Also see page 22 for her heightened genetic risk profile.)



MYPERIOPATH MOLECULAR ANALYSIS OF PERIODONTAL AND SYSTEMIC PATHOGENS

Result: PATHOGENIC BACTERIA DETECTED, 7 ABOVE THERAPEUTIC THRESHOLD

Bacterial Risk: HIGH - Very strong evidence of increased risk for attachment loss

Legend
— = Therapeutic Threshold*
DL = Detection Limit

Result Interpretation: Periodontal disease is caused by specific, or groups of specific bacteria. Threshold levels represent the concentration above which patients are generally at increased risk for attachment loss. Bacterial levels should be considered collectively and in context with clinical signs and other risk factors.

High Risk Pathogens | Moderate Risk Pathogens | Low Risk Pathogens

10^7 10^6 10^5 10^4 DL

Pathogen	Result	Clinical Significance
Pg Porphyromonas gingivalis	High	Very strong association with PD: Transmittable, tissue invasive, and pathogenic at relatively low bacterial counts. Associated with aggressive forms of disease.
Tf Tannerella forsythia	High	Very strong association with PD: common pathogen associated with refractory periodontitis. Strongly related to increasing pocket depths.
Td Treponema denticola	High	Very strong association with PD: invasive in cooperation with other bacteria. Usually seen in combination with other bacteria.
En Eubacterium nodatum	High	Strong association with PD: specific role uncertain. Often seen in refractory disease.
Fn Fusobacterium nucleatum/periodonticum	High	Strong association with PD: adherence properties to several oral pathogens; often seen in refractory disease.
Pi Prevotella intermedia	High	Strong association with PD: virulent properties similar to Pg; often seen in refractory disease.
Cr Campylobacter rectus	High	Moderate association with development of PD: usually found in combination with other suspected pathogens in refractory disease.
Aa Aggregatibacter actinomycetemcomitans	Low	Very strong association with PD: Transmittable, tissue invasive, and pathogenic at relatively low bacterial counts. Associated with aggressive forms of disease.
Pm Peptostreptococcus (Micromonas) micros	Low	Moderate association with PD: detected in higher numbers at sites of active disease.
Cs Capnocytophaga species (gingavalis,ochracea,sputigena)	Low	Some association with PD; Frequently found in gingivitis. Often found in association with other periodontal pathogens. May increase temporarily following active therapy.
Not Detected:		(Ec) Eikenella corrodens

Is Periodontal Disease Transmissible?

Yes, definitely! A three second kiss has been shown to transmit about 40 million saliva bacteria and parasites. It is important to get your spouse or anyone you kiss treated to avoid reinfecting yourself after treatment. Periodontal bacteria, caries bacteria, and parasites can also be transmitted to your children starting when they are young.

You can also get periodontal disease bacteria and parasites from your dog or cat, since they have a high rate of periodontal infection. Those lovable face licks can transmit periodontal disease. Ideally, start brushing your pet's teeth when they are very young to get them used to it.

In addition, periodontal bacteria and parasites can be picked up from food and water, especially in the Caribbean. Drink only bottled water and avoid uncooked food in most developing countries. (See pages 23-24 for a questionnaire regarding the possible contamination sources for bacteria and parasites causing periodontal disease.)

Is Periodontal Disease Hereditary?

No. It is a bacterial and protozoan infection transmitted from others as discussed above. However, an increased susceptibility to this infection can be inherited. According to one recent study, up to 50% of the population may have some genetic susceptibility to periodontal disease. A commercially available test has recently been developed to test for eight genetic markers, genetic variations involved in bone resorption and the inflammatory response. (See next page.) We advise this test when patients tell us they have several family members with periodontal problems. In addition to heredity, other major risk factors are smoking and diabetes. However, if you control the bacteria and protozoans causing the infection, no periodontal disease will occur even if you have any of these risk factors.

Genetic Analysis for Markers of Oral and Systemic Infection

Genetic analysis of eight genes shows this 28-year-old patient with severe periodontal disease has an intermediate risk of an enhanced immune response to specific periodontal pathogens, and an intermediate risk for chronic systemic inflammation, producing an increased risk of cardiovascular disease and type 2 diabetes mellitus. This helps explain her severe periodontal disease, and means extra intensive treatment and maintenance will be required to keep her periodontal pathogens at a low level to prevent recurrence of the disease. (See page 20 to view her high levels of most periodontal pathogens.)

CELSUS ONE: GENETIC ANALYSIS FOR MARKERS OF ORAL AND SYSTEMIC INFLAMMATION

Type of Immunity	Gene Marker	Genotype	Inflammation Index
Innate	Beta-defensin 1 (DEFB1)	G/G	Low Risk
	CD14 (CD14)	T/T	
	Toll-like receptor 4 (TLR4)	AA/CC	
Acquired	Tumor necrosis factor alpha (TNF-alpha)	C/T	Intermediate Risk
	Interleukin 1 (IL1)	CC/CC	
	Interleukin 6 (IL6)	C/G	
	Interleukin 17A (IL17A)	G/A	
	Matrix Metallopeptidase 3 (MMP3)	6A/6A	

Interpretation:

The genotypes for markers DEFB1, CD14 and TLR4 for this individual collectively predict a normal phenotype for the innate immune system and a low risk for chronic systemic inflammation. Specifically, the expected level of gene expression, and or levels of these proteins, is normal in response to environmental and disease causing bacteria and other effectors of inflammation. See comment.

The genotypes for markers TNF-alpha, IL1, IL6, IL17A, and MMP3 predict a slightly enhanced immune response to specific pathogens and an intermediate risk for chronic systemic inflammation. Based on this, gene expression and the corresponding protein levels, in response to disease causing bacteria and the other effectors of the acquired immune system, are predicted to be increased. See comment.

Disclaimer: The reported genotypes are a subset of the group of genes that comprise the complete immune system. This genetic analysis may not detect specific immunologic diseases or predict the health and effectiveness of a person's immunity for specific diseases. Such an evaluation may require genetic counseling and testing directed to characterize these genetic conditions.

Comments:

The innate immune system is the body's first line of defense against pathogenic organisms and a major cause of oral and systemic inflammation. The innate immunity functions to create a physical and chemical barrier to bacteria, the recruitment of inflammatory cells to the site of infection, the release of cytokines and the activation of the complement cascade to localize and eliminate bacteria and recruit antigen-recognizing lymphocytes. The acquired immune system involves the production of specialized cells that eliminate or prevent pathogen growth and is the basis for immunologic memory.

- **Periodontitis:** The genotypes for the combination of the innate immune system markers predict the ability to maintain a normal balance of the commensal oral bacteria. If periodontal bacterial infection occurs, the appropriate cellular and cytokine inflammatory response should be initiated. The acquired immune system TNF-alpha, IL6, and IL17A genotypes predict an accentuated inflammatory response to infection resulting in an increased cytokine gene expression, and the proliferation of osteoclasts resulting in the destruction of periodontal ligament and alveolar bone characteristic of periodontal disease. The normal genotypes for IL1 and MMP3 may have the effect to lessen the intensity of the cellular and cytokine response and the severity of periodontal tissue and bone degradation.
- **Cardiovascular:** The polymorphism within the promoter of the IL6 gene -174 G/C is associated with variable risk of systemic inflammatory conditions. The high risk 'G' allele has been linked to cardiovascular disease, but there is limited data as to the effect of this gene as a sole factor. By contrast, there is significant evidence that IL6 increases the risk of morbidity, and possible mortality, consequent to a cardiovascular event (MI or chronic coronary insufficiency) or with treatments for the same. Subgroup analyses indicate an ethnic association of risk for the carriers of the -174C allele; a 12% increased risk of CAD in Caucasian populations, whereas in East Asians there is a 37 - 46% reduction of risk.
- **Type II Diabetes:** Persons who are carriers of the IL6 -174 G/G genotype and who are obese have a higher incidence of insulin resistance (IR) and are at greater risk for type 2 diabetes mellitus. The contribution of this genotype to disease development may be the direct effect on pancreatic beta cells that produce insulin or due indirectly through the actions of other immune inflammatory mediators.

Questionnaire Regarding Possible Contamination Sources for Bacteria and Parasites Causing Periodontal Disease

Adapted from Dr. Mark Bonner

Microbiological analysis of microbes in the plaque around your teeth found pathogenic bacteria and other parasites.

The observed bacteria and parasites are transmitted by contamination during either direct or indirect contact with other people infected with these parasites, or with animals, and among other things, tap water, water bottles, and vegetables or raw fruit that were washed with contaminated water (in hot countries – in the Caribbean, in particular).

During your treatment, we are going to try with you to understand, and above all, avoid all sources of recontamination.

That is why we ask you to please read carefully and fill out the questionnaire below.

1. Does your spouse or significant other have periodontal problems? YES NO

2. Have they been examined for periodontal problems? YES NO

3. Did they have a microbiological examination? YES NO

4. Do other people in your life (including parents, relatives, and former significant others) with whom you have or have had direct or indirect contact (you drink from the same bottle, share meals, kisses etc ...) have periodontal problems? YES NO

5. Have they ever been examined for periodontal problems? YES NO

6. Did you know that your environment can be a direct or indirect source of contamination in periodontal disease? YES NO

7. Do you have any pets? YES NO
   If YES what kind? _____
   Number and how old are they? _____

8. Have you changed your old toothbrush? YES NO

9. How often do you change? _____

10. Do you share your toothbrush with others? YES NO

11. Do you share your cups, glasses, water bottles, or other? YES NO

At home? YES NO
At work? YES NO
At sports events? YES NO

12. Did you travel abroad? YES NO

If yes where and when? _____
_____
_____

If traveling in tropical countries:

13. Do you eat raw fruits and vegetables while you travel? YES NO

14. Do you drink tap water while you travel? YES NO

15. Do you brush your teeth with tap water while you travel? YES NO

16. Do you shower with your mouth open during your travel? YES NO

It is important to take the time to wonder about the possible sources of contamination in periodontal disease.

By taking the necessary measures, you will avoid contaminating yourself again or contaminating a person close to you.

Tight, healthy gums which don't bleed are also an excellent barrier to contamination.

So be reassured that at the end of your treatment, when your gums are healed, if you keep up your home care, recontamination is much less likely.

Yours in Better Total Health,
Drs. Tom and Mark McCawley and Team

"Saving Lives by Saving Smiles"

The Effects of Periodontal Disease on Health

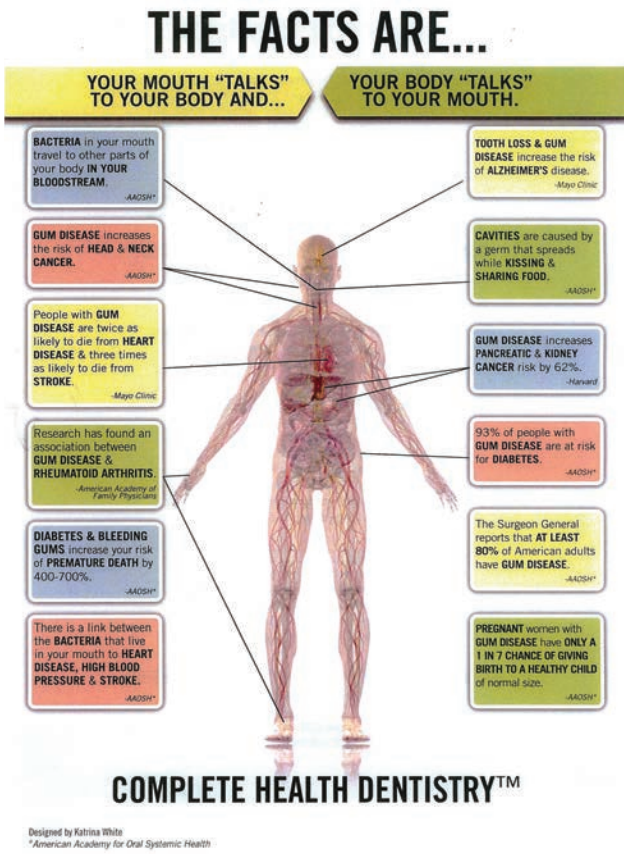
It is important to diagnose and treat the bacteria causing gum disease, not only to save your teeth, but also to save your life. These bacteria get in the bloodstream and increase the risk of many diseases. (See next page.) Former U.S. Surgeon General, C. Everett Koop has said, "You can't be healthy without good oral health."

Gum disease has been proven to substantially increase the risk of heart disease. A recent American Heart Association study found that it increases the risk of first heart attacks by 28 percent.

It also increases the risk of Alzheimer's disease. The bacteria that cause gum disease have been found in the brains of nine percent of Alzheimer's patients.

Gum disease has been found to increase the risk of several cancers, including a 55 percent increased risk of pancreatic cancer.

In addition, the bacteria from gum disease have been found to increase the risk of diabetes, rheumatoid arthritis, and stroke, making it very important to have gum disease treated to protect your overall health and well-being.



Managing Peri-Implantitis

Implants are just as susceptible to periodontal infection as teeth, especially if the remaining teeth have periodontal disease. The same bacteria that infect teeth and cause periodontal disease also infect implants and cause peri-implantitis.

A recent study of peri-implantitis found 79 percent of cases were caused by bacteria, and six percent by retained cement. Implant placement error accounted for nine percent, lack of keratinized gingiva caused five percent, and adjacent or latent periapical pathology caused the final two percent. (See page 29.) Peri-implantitis is detected by probing with metal probes and radiographs which may reveal pockets, bleeding, exudate, and bone loss. Exudate is a special concern and requires treatment. It has been called "liquid bone" by the late implant expert Carl Misch.

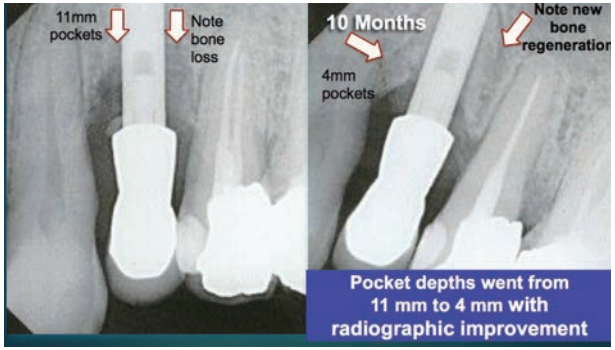
Multiple additional implant variables combine to cause peri-implantitis and complicate its repair, including but not limited to implant type and length, thread design and finish, abutment length and type, crown cleansability, occlusal load, vertical and horizontal tissue thickness, and patient host factors.

Once periodontal infection starts on implants, bone loss can be more rapid than on teeth. This is because implants, unlike teeth, lack fibers that attach directly to the bone to resist the down-growth of infection. (See page 30.)

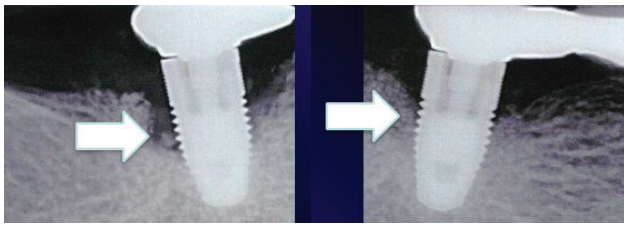
Several studies have found that as many as 56 percent of patients will develop peri-implantitis. A survey of periodontists reported that up to ten percent of implants must be removed because of peri-implantitis.

Peri-implantitis can be prevented by good home care including flossing, brushing, and irrigation, and regular periodontal maintenance visits every three to six months. Special attention is devoted to removing any retained cement on the implant crowns. The specific bacteria causing the implant infection can be identified and then treated with specially-selected antibiotics and antiseptics. Early treatment of any bleeding can prevent progression to peri-implantitis.

Once the implant threads are exposed, peri-implantitis is treated the same way as periodontal disease on teeth, including plaque control, ultrasonic scaling and bite adjustment. A new laser treatment, Laser-Assisted Peri-Implantitis Procedure (LAPIP), and new bone grafting techniques, show promise if the bone loss is not too severe. (See X-rays below and Appendix page 79 for biologic response of implants to Nd:YAG laser.) With treatment, most implants can be maintained for years. Severely infected implants may need to be removed. The site can then be bone grafted and a new implant can be placed later if desired.



The X-ray on the left shows bone loss all around the implant with diseased 11 mm pockets. Ten months following laser treatment (LAPIP), the X-ray on the right shows the pocket depths were reduced from a diseased 11 mm to a healthy 4 mm, and new bone was regenerated all around the implant.



The X-ray on the left shows a failing implant with bone loss treated by Nd:YAG laser disinfection and bone grafting. The X-ray on the right shows new bone growth around the implant, thus saving the implant.

Causes and Microbial Characteristics of Peri-Implantitis

A Classification System for Peri-implant Diseases and Conditions

Sarmiento et al., UPenn, IJPRD, Oct.,2016

- 152 patients - 270 ailing implants from various manufacturers
- 32 smokers, 19 diabetics, cemented 32%, screw retained 68%

1. **78.8%** (213 implants) were related to **bacteria** - induced inflammation with bone loss.
2. **8.52%** (23 implants) were related to **iatrogenic factors**, such as thinning of buccal plate or placing an implant too buccally.
3. **5.5%** (15 implants) were related to **cement**.
4. **4.8%** (13 implants) were related to **absence of keratinized gingiva**.
5. **2.2%** (6 implants) were related to **periapical lesions** on adjacent teeth.

Microbial Characteristics of Peri-Implantitis

DeWaal, Winkel, van Winkelhoff
J. Perio., February 2017

Methods: Microbial samples from 85 patients with peri-implantitis and from 69 patients with only healthy implants.

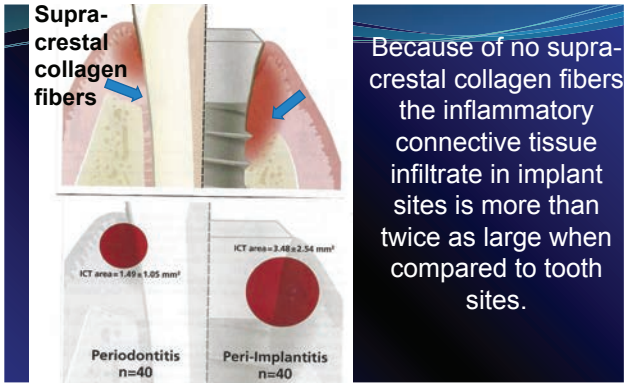
Results: The periodontal pathogens P. intermedia odds ratio: 15.1, T. forsythia odds ratio 13.3, P. gingivalis and F. nucleatum were significantly associated with peri-implantitis.

Staphylococcus and Aa do not seem to play an important role in peri-implantitis.

Unique Histology of Peri-Implantitis

Prevalence and Mechanisms of Peri-implant Diseases: A Critical Review
Salvi et al., J. Dent Res, January 2017

- Tissue destruction at experimental peri-implantitis sites is faster, more aggressive and more extensive than at experimental periodontitis sites.
- They represent distinct entities from a histopathological point of view.
- To avoid implant loss, patients diagnosed with peri-implantitis should be treated without delay.



Because of no supra-crestal collagen fibers the inflammatory connective tissue infiltrate in implant sites is more than twice as large when compared to tooth sites.

Causes and Prevention of Dental Caries

It is very simple to reduce caries. Have patients reduce the frequency of their sugar intake. However, it is not always so simple to find the source of the sugar, but it is always there.

Tooth decay exploded around the world after sugar from the Caribbean became widely available in the early 1800s. Prior to that, caries were infrequent.

The problem is that sugar is hidden in many foods. Sugar also occurs as fructose in fruits, which also causes lots of caries.

Frequency of sugar intake is critical. Every time patients put a product which contains sugar or fructose in their mouths, they get a 45-minute acid attack on the tooth, which eventually produces a hole in the tooth (caries). Sipping these drinks produces constant acid attacks, so it is better to "gulp, don't sip."

The more often patients eat or drink these products, the more often the acid attack occurs. Between-meal snacks, fruits, and drinks with sugar produce this acid attack more frequently each time they are ingested, accelerating the development of caries. Encourage patients to substitute sugar-free products, especially those containing xylitol. Very frequent use of sorbitol products can also cause caries.

Of course, flossing and brushing helps. Adding a fluoride toothpaste and rinses, such as Act Complete, will make the teeth more resistant to the acid attack, since sugar and fructose are metabolized by bacteria to produce cavity-causing acid.

A prescription-strength, high fluoride toothpaste like PreviDent 5000 for daily home use, and a high fluoride varnish applied at each maintenance visit will help. MI Paste Plus containing calcium phosphate to remineralize the teeth, and fluoride can also be applied to the teeth for three minutes each day.

But nothing works like reducing sugar and fructose intake.

Managing Xerostomia

Dry mouth is caused by many medications and increases with aging as the salivary glands atrophy. It also occurs in a condition known as Sjogren's syndrome, or after radiation for oral cancer. It can be very damaging to the teeth because the neutralizing ability of saliva is lost, leaving caries-causing Streptococcus mutans to have a field day.

Patients should reduce sugar-containing products, including fruits. Encourage them to avoid sugar- containing mints such as Altoids. They can use xylitol-containing mints, and place over the counter XyliMelts or OraMoist wafers on their cheeks at night to stimulate saliva.

Rinsing frequently with water will help moisturize tissue. Biotene mouthwash can help. It also helps to rinse with a fluoride rinse like ACT Complete, and use a prescription high-fluoride toothpaste like PreviDent to make the teeth more resistant to decay.

In severe cases of dry mouth, as in Sjogren's syndrome and cancer radiation, the patient's physician can prescribe pilocarpine.

Eliminating Halitosis

We all know someone with bad breath because at least 35 percent of the population suffers from bad breath. Unfortunately, most don't know they have it. Even if they do know, they have no idea how to get rid of it. After treating hundreds of patients with bad breath, and also attending the World Congress on Bad Breath in Brussels, Belgium, we suggest six steps to eliminating bad breath.

1. First, patients can determine if they actually have bad breath by asking a significant other or a dental professional. It is not normally possible to determine bad breath on oneself.

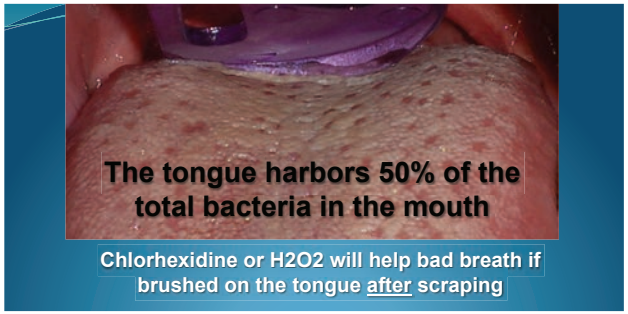
2. Patients should eliminate or reduce their intake of odor-causing foods like onions and garlic. These odors come out through the lungs for up to 24 hours after ingestion. Bad breath rarely comes from the stomach, and very rarely, from the sinuses.

3. **Examine the very back of the tongue for tongue coat.** There are millions of bacteria on the back of the tongue in this tongue coat. These bacteria produce sulphide odors which are the primary source of most bad breath. We suggest patients use a tongue scraper to scrape the very back of the tongue ten to 15 times every morning. Using a toothbrush to clean the tongue is like using a broom to clean a shag rug.

4. Patients should be examined and treated if they have periodontal disease. The pockets under the gum contain millions of odor-causing bacteria.

5. Patients should clean the bacterial plaque from between the teeth with floss or other tools since this is where many bacteria hide. **Smelling their floss is one way to get an indication of bad breath and periodontal infection.**

6. Finally, patients should be aware that most mouthwashes, mints, and gum offer only very temporary help, but mouthwashes that contain zinc, like Smart Mouth, offer several hours benefit. Sugar-containing gum and mints like Altoids are also a major cause of cavities.



Only your children or grandchildren will tell you!

Diagnosing and Treating Orofacial Pain

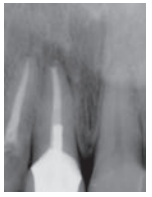
Diagnosing and Treating Tooth-Related Pain

A symptomatic tooth may have pain of pulpal and/or periodontal origin. The nature of that pain is the first clue in determining the etiology of such a problem. Radiographic and clinical evaluation is essential in arriving at the diagnosis.

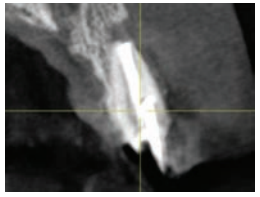
Endodontic Treatment

If the pain is severe or sharp, keeps the patient up at night, and is exacerbated by thermal changes lasting more than 15 seconds, it likely means the pulp of the tooth is dying and the patient will need endodontic treatment. Other indications that the tooth may need endodontic treatment include pain on biting, pain when the apex of the root is palpated, and pain in the region of the ear.

If prior endodontic treatment has been completed and pain returns, endodontic retreatment or endodontic surgery may be considered. If these treatments are not successful, the tooth may need to be extracted and replaced by a fixed prosthesis or an implant. (See radiograph and CBCT scan below.)



A periapical radiograph shows prior endodontic treatment, suggests that redoing the endodontics would be difficult, and that an immediate dental implant could possibly be placed.

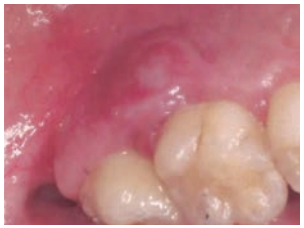


A 3-D X-ray rules out the possibility of redoing the endodontics and placing an immediate implant due to significant bone loss and infection at the end of the root. An implant can be placed later after extraction and bone grafting.

Periodontal Problems

If the pain is dull and less severe, periodontal etiology should be considered. Usually the patient can identify the specific location of the pain in contrast to pulpal pain, which can be difficult to localize. Exudate and pocket depth of at least 5 mm or more is usually present.

Periodontal therapy with debridement, irrigation, and topical antibiotics will usually manage the acute infection. For larger infections, systemic antibiotics are often needed. Later conventional periodontal therapy is usually required.



A large lingual periodontal abscess on an upper molar that probes 9 mm. Initially treated with debridement and Arestin, it will require more definitive periodontal therapy.

Root Sensitivity

If the pain is made worse by thermal changes lasting only a few seconds without pain on mastication, the source may be root sensitivity. Root sensitivity can be treated by desensitizing medications. (See page 42.)

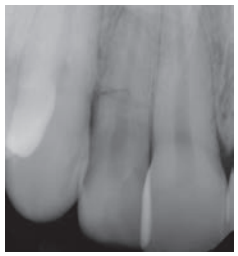
Cracked Teeth

If the pain is sharp when biting and lasts only a few seconds, the patient may have a crack in the tooth.

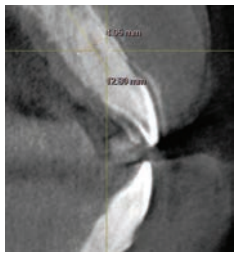
If the crack is confined to the coronal aspect of the tooth, the tooth can often be saved without endodontic therapy and with a full coverage restoration. If the crack involves the pulp, the problem is often resolved with endodontic and restorative therapy. The most common teeth to have a crack are the mandibular molars, followed by the maxillary molars and premolars.

Providing crown lengthening below the fracture line and a full coverage restoration will usually resolve the problem.

If the tooth has a large crack or a vertical root fracture, it will usually have to be extracted and replaced by an implant or bridge. (See radiograph and CBCT scan below.)

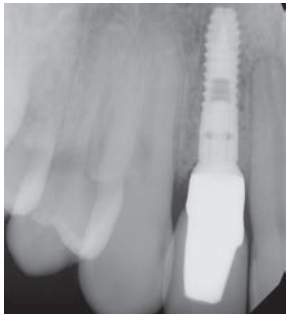


A periapical radiograph reveals a horizontal fracture on the upper right lateral incisor at the level of the crestal bone.



A 3-D X-ray of the fractured tooth reveals good bone thickness which would allow placement of an immediate implant.

The tooth was removed and an implant placed and restored.



See pages 84 and 85 for a Chart of Tests for a Differential Diagnosis of Orofacial Pain.

Conservative Management of Temporomandibular Joint Pain

Pain in the jaw when opening and biting may involve the temporomandibular joint (TMJ) and surrounding muscles. It usually involves spasm in the muscles that open and close the mouth. Pain in these muscles is like a strained muscle in other parts of the body and is treated similarly.

The following self-management steps may provide some relief for most TMJ muscle pain.

1. Cold packs can be applied intermittently, 15 minutes on and 15 minutes off, on the sore muscle or joint when the pain is acute. If the pain is chronic, hot packs can be applied for 15 minutes on and 15 minutes off for two hours once or twice each day as long as pain continues.

2. Patients can rest jaw muscles by eating soft foods, avoiding chewing gum, and clenching their teeth. If patients clench, have them put lips together, teeth apart and take two deep breaths to relax.

3. Advise patients not to open their jaws wide, and to limit their jaw opening when yawning.

If relief is not obtained, professional assistance will likely be required.

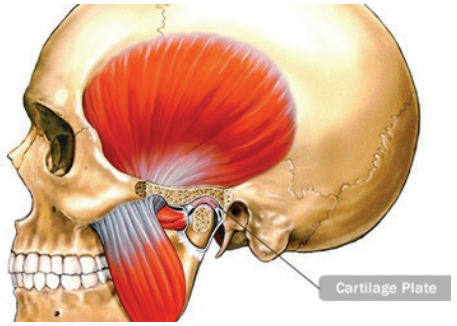
1. An occlusal bite plane can be constructed to help the patient relax the jaw muscles and significantly contribute to the diagnosis of the etiology. Patients can wear the bite plane at night if discomfort is mild. For more severe pain, a bite splint can be worn for 24 hours each day to help bring relief. The use of this intraoral appliance may permit the muscles of mastication to relax, and diminish the muscular spasms.

2. If it is determined that occlusal factors are contributing to the TMJ pathology and symptoms, changes in the occlusion by occlusal equilibration and/or orthodontics may be indicated.

3. Anti-inflammatory medications like naproxen or ibuprofen can help relieve pain.

4. For acute pain, a muscle relaxant Robaxin can be prescribed (two 500 mg tablets four times a day) to help reduce the spasms and discomfort.

5. If the pain is severe or not relieved by these steps, referral to a dentist who has expertise in TMJ treatment may be considered. Additionally, TMJ images should be considered to rule out other causes of the patient's symptoms, and to help diagnose the etiology of the discomfort.



Pain in the jaw when opening and biting usually involves the muscles in the temporomandibular joint that open and close the mouth. Pain in these muscles is like a strained muscle in other parts of the body and is treated similarly.

Causes and Treatment of Root Sensitivity

One of the main causes of root sensitivity is eating lots of fruit or drinking fruit juices. Fruit is obviously good for us, but it also causes lots of caries and root sensitivity. Most fruits are very acidic and contain lots of fructose. The acids in fruits are responsible for much of the root sensitivity that we see. The occlusion should also be evaluated.

Other acidic causes of sensitivity are vinegar, yogurt, sports and soft drinks, and tea. **Check the patient's diet closely for acidic content if they are experiencing root sensitivity.** These acids open up dentinal tubules in the root and allow cold, hot, or touch stimuli a pathway into the pulp of the tooth, causing pain. The pain is usually short lived. If the pain lasts for more than a few seconds, the pulp may be infected and endodontic treatment may be indicated.

Drinking acidic drinks through a straw, and eating and swallowing fruits quickly, will minimize acidic exposure to tooth roots. Rinsing with water immediately after ingesting will dilute the acidic effect. Patients should wait to brush for at least 30 minutes as the acids soften the roots, making them more susceptible to wear notching and cemental abrasion.

Sipping acidic drinks is especially damaging by keeping acid on the root. Drinking quickly reduces the time of acid demineralization, so advise your patients: "gulp, don't sip" to reduce sensitivity.

The fructose in fruits is closely related to sucrose (sugar). It will cause caries just like all sugar products, including, and especially, Altoids, Tic Tacs, and other sugar-containing breath mints.

To help control sensitivity, patients can use toothpastes containing potassium nitrate and fluoride, like Sensodyne, and rinse with fluoride rinses, like Act Complete. Over-the-counter Sensi-Strips can be applied daily for ten minutes to block the tubules with oxalate crystals. More potent prescription fluoride pastes are available which will protect roots and also reduce caries. In the office, fluoride varnish or TEETHMATE DESENSITIZER can be applied.

If sensitivity continues, the roots can often be covered with Pinhole Surgery.

Prevention and Manangement of Necrosis of The Jaw Resulting from Drugs Taken for Osteoporosis

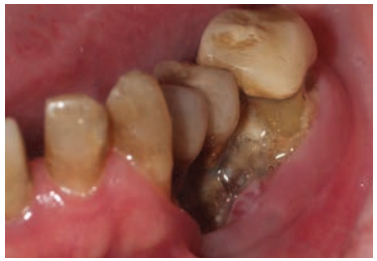
Summarized from a Position Paper on Drug-Induced Osteonecrosis of the Jaws (DIONJ)

by Robert E. Marx, DDS, and Ramzey Tursun, DDS
University of Miami Division of Oral and Maxillofacial Surgery, September 27, 2016

The current drugs that place osteopenia and osteoporosis patients at risk for DIONJ are the oral bisphosphonates alendronate (Fosamax and generic equivalents), residronate (Actonel and Atelvia), and ibandronate (Boniva); the subcutaneously-injected denosumab (Prolia and Xgeva); and the intravenous bisphosphonate zoledronate (Reclast and Zometa). All of them impair osteoclastic bone resorption, and therefore bone renewal, thereby retaining old bone and reducing its ability to turn over. Because the alveolar bone in the jaws turns over faster and more than any other bone in the adult skeleton, it is the focal point for DIONJ from these drugs.

Of the oral bisphosphonates, alendronate (Fosamax) is the drug linked to 96 percent of cases of DIONJ caused by an oral bisphosphonate, compared to three percent of cases caused by residronate (Actonel) and one percent of cases caused by ibandronate (Boniva). This is mostly due to the fact the alendronate is marketed at twice the dose of all other bisphosphonates (70 mg/week), while it has the same absorption, distribution, and the same potency as the others.

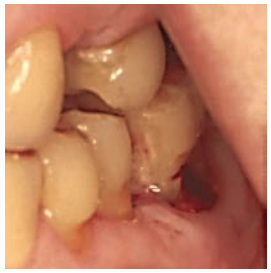
Drug induced osteonecrosis after periodontal osseous surgery on a patient taking Fosamax for four years.



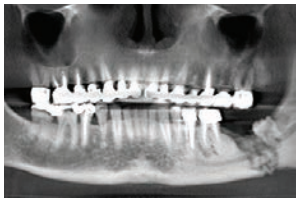
Although zoledronate as Reclast is relatively new, and only 5 mg is delivered by IV only once yearly for osteoporosis, it is causing several cases of DIONJ. This is because the half life in bone of 11 years is the same for all the bisphosphonates, and the IV infusion loads the bone 140 times more than any oral bisphosphonate.

Therefore, dental professionals must realize that, although some DIONJ cases may occur sooner, the significant DIONJ risk for an oral bisphosphonate begins at about three years of weekly dosing, and with IV Reclast, at about the fourth yearly dose. Those osteopenia/osteoporosis patients converted to Reclast after taking an oral bisphosphonate are at risk for DIONJ before the fourth dose, and may need a drug holiday longer than nine months. The FDA has recommended that no one needs to take a bisphosphonate for more than five years because it leads to a greater risk of DIONJ.

Denosumab (Prolia and Xgeva) as a RANK ligand inhibitor does not seem to bind to bone or accumulate in bone as do bisphosphonates, and has a half life in bone of 26 days. Therefore, if this drug has been taken for less than three years, discontinuation with a shorter drug holiday of three months is adequate. Switching from a bisphosphonate to denosumab causes necrosis relatively frequently and should be avoided.



Necrotic bone on the facial of a molar after osseous surgery on a patient taking Boniva for several years.



This panorex shows severe osteonecrosis of the mandible after an extraction on a patient taking Prolia.

Prevention – What to Do and What Not to Do

The initiating event for DIONJ is surgery within the alveolar bone: tooth removals (62%), osseous periodontal surgery (5.6%), dental implants (2.2%), bone biopsy (1.1%), and apical resective root canal therapy (0.5%) with 29% spontaneous development. Occlusal trauma is also a significant factor on the lingual of lower molars. For those patients requiring bone surgery who are taking an oral bisphosphonate, it is reasonable to assess the bone turnover suppression by requesting a morning fasting serum c-terminal telopeptide (CTX) test. A value of 150 pg/ml or greater is consistent with bone healing, if the test is not invalidated by cancer, or by steroids or methotrexate. When the CTX test is above 150 pg/ml, the planned alveolar bone surgery can be accomplished, and a three-month drug holiday requested from the prescribing physician to cover the healing period. If the CTX value is below 150 pg/ml, a drug holiday prior to performing alveolar bone surgery, placing implants, or orthodontic treatment is advisable. For patients who have taken an oral bisphosphonate for more than three years, the initial CTX is usually below the 150 pg/ml level. For such patients, a longer drug holiday is usually necessary, and many are required to be as long as nine months or more.

Treating DIONJ in the Osteopenia/Osteoporosis Patient

The exposed bone represents necrotic bone. If the offending drug is continued, the area of exposed bone is likely to increase, and secondary areas of exposed bone may develop. It is advised to request a drug holiday from the prescribing physician. Studies have shown that a drug holiday of nine months will result in a spontaneous sequestration and exfoliation of the exposed bone, followed by mucosal healing in 50 percent of cases. These cases are usually the smaller areas of exposed bone. During this drug holiday, use 0.12 percent chlorhexidine oral rinses three times daily to prevent secondary infection. If secondary infection develops, penicillin VK 500 mg QID, or doxycycline 100 mg once daily, are the best antibiotics to use. For larger areas of osteonecrosis, referral to an oral surgeon is indicated. (See page 49 for a list of drugs used to treat osteoporosis and cancer complications.)

Medications and Medical Guidelines

Drugs Used to Treat Osteoporosis and Bone Cancer Which May Cause Osteonecrosis of the Jaws

Osteoporosis Drugs

Drug	Classification	Action	Dose	Route	% of Reported Cases of Osteonecrosis
Alendronate (Fosamax Generic)	Bisphosphonate	Osteoclast Toxicity	70 mg/wk	Oral	82%
Residronate (Actonel Atelvia)	Bisphosphonate	Osteoclast Toxicity	35 mg/wk	Oral	1%
Ibandronate (Boniva)	Bisphosphonate	Osteoclast Toxicity	150 mg/mos	Oral IV	1%
Zoledronate (Reclast)	Bisphosphonate	Osteoclast Toxicity	5 mg/yr	IV	6%
Denosumab (Prolia)	Monoclonal Antibody	Osteoclast Impairment	60 mg/6 mos	Subcutaneous	10%

A fasting CTX value of 150 pg/ml or greater is consistent with bone healing if the test is not invalidated by cancer, or by steroids or methotrexate. If below 150 pg/ ml, or test not available, then a physician-requested drug holiday of three months for Prolia and Xgeva and nine months for all others is advised. Teriparatide (Forteo) and Abaloparatide (Tymlos) daily parathyroid hormone receptor agonist injections that rebuild bone, and raloxifene (Evista), a daily pill that modulates estrogen receptors, are also used to treat osteoporosis. They work differently, so no special surgical precautions are necessary to prevent osteonecrosis.

Drugs Used to Treat Bone Cancer

Drug	Classification	Action	Dose	Route	% of Reported Cases of Osteonecrosis
Zoledronate (Zometa)	Bisphosphonate	Osteoclast Toxicity	4 mg/mo	IV	67%
Pamidronate (Aredia)	Bisphosphonate	Osteoclast Toxicity	90 mg/mo	IV	18%
Bevacizumab (Avastin)	Monoclonal Antibody	VEGF Inhibitor	100-400 mg/ 14 days	IV	<1%
Sunitinib (Sutent)	Tyrosine Kinase Inhibitor	Osteoclast Toxicity	5 mg/yr	IV	<1%
Denosumab (Xgeva)	Monoclonal Antibody	Osteoclast Inhibitor	120 mg/mo	IV	15%

Intravenous drugs, because of much higher doses, create much more risk of osteonecrosis. The incidence of osteonecrosis resulting from oral medications is estimated at 1 in 1000, but increases the longer the oral medications are taken, especially after three years.

***Data from Dr. Robert Marx,**
University of Miami Division of Oral and Maxillofacial Surgery as of July 1, 2016

What Antibiotics to Use to Treat Oral Infections

It depends on where the infection is located and what bacteria are causing it. Wynn has stated that three factors need to be considered: (See References on page 83.)

"1. The identity of the organism must be known.

2. Accurate information regarding antibiotic susceptibility is required.

3. Host factors in terms of the ability to absorb the antibiotic should be taken into account."

He points out that for most dental infections, the first two are seldom known. Most oral infections are mixed aerobic and anaerobic infections, and the antibiotic is chosen empirically based on the probable cause.

For early periodontal disease and gingivitis, systemic antibiotics are seldom needed since mechanical removal, combined with antiseptics, and occasionally, localized antibiotic placement, work well.

For advanced, aggressive, or refractory periodontal disease, antibiotics have proven to be almost essential to control the mostly anaerobic infection by as many as 15 different pathogens, plus protozoas, like amoeba and trichomonads. In these cases, identifying the organisms and their antibiotic sensitivities is very helpful. This can be accomplished by culturing, DNA analysis and microscopic smears. (See pages 19, 20 and 52.) With this information, the appropriate antibiotic can be chosen. (See Antibiotics of Choice for Dental Infections on the next page.) This significantly enhances the potential for control and possible cure of these aggressive periodontal infections.

Antibiotics of Choice for Oral Infections

Before prescribing any of these antibiotics, consult drug references for side effects and drug interactions.

1. Penicillin VK 500 mg QID or amoxicillin 875 mg BID.
   Be sure to incise and drain if possible, and scale periodontal abscesses. **Avoid if the patient is taking methotrexate.** Penicillins increase the levels of methotrexate.
2. If no response in 24-48 hours, then use:
   A. Clindamycin 300 mg TID
   B. Amoxicillin clavulanic acid 500 mg TID (Augmentin)
   Metronidazole 500 mg TID **(if the patient is not taking warfarin and does not have a history of central nervous system (CNS) disorders)**. Metronidazole can be added to amoxicillin to get more gram negative anaerobic coverage.
   C. Cephalexin (Keflex) 500 mg QID, or cefaclor (Ceclor) 500 mg BID

All antibiotics are taken for seven to ten days.**All antibiotics, especially clindamycin, should be stopped at the first sign of diarrhea.**

If the patient is allergic to penicillin:

1. Clindamycin 300 mg TID
2. Azithromycin (Z-Pak) – one pack (6 x 250 mg), two tablets the first day, then one tablet days two through five. **Use with caution for patients with cardiac arrhythmias or taking amiodarone (Cardarone).**

If the penicillin allergy is not the anaphylactic type:

1. Cephalexin (Keflex) 500 mg QID or cefaclor (Ceclor) 500 mg BID

The FDA has issued a warning against the use of systemic fluoroquinolones, such as ciprofloxacin (Cipro) and levofloxacin (Levaquin), because of the risk of numerous serious side effects, including tendon rupture, peipheral neuropathy, and prolonged central nervous system effects. These should be used only when there is no alternative, such as after bacterial identification by culturing of enteric rods. (See next page for a culture report on antibiotic resistance.)

Laboratory Report of a Culture Which Identifies the Actual Bacterial Cause of Periodontal Disease in a Patient And the Appropriate Antibiotics to Use

Laboratory Report Showing Antibiotic Resistance

Putative Periodontal Pathogens Presumptive Identification (critical % threshold level)	% Cultivable Microbiota	Antibiotic Resistance Testing S = 100% in vitro inhibition at threshold value Doxycycline (4 µg/ml)	Amoxicillin (8 µg/ml)	Metronidazole (16 µg/ml)	R = resistant Clindamycin (4 µg/ml)
Aggregatibacter actinomycetemcomitans (0.01%)	**0.0**				
Red Complex Species:					
Porphyromonas gingivalis (0.1%)	**0.0**				
Tannerella forsythia (1%)	**0.0**				
Orange Complex Species:					
Prevotella intermedia (2.5 %)	**8.3**	R	R	S	R
Fusobacterium nucleatum (10%)	**1.7**	S	S	S	S
Parvimonas micra (P. micros) (3%)	**13.3**	S	S	S	S
Campylobacter rectus (2%)	**0.8**	S	S	S	S
Streptococcus constellatus (2.5%)	**20.8**	S	S	R	S
Other Opportunistic Species:					
Streptococcus intermedius (5%)	**0.0**				
Enteric gram negative rods (5%)	**33.3**	R	R	R	R
Enterococcus faecalis	**0.0**				
Staphylococcus aureus	**0.0**				
Candida species (yeast)	**0.0**				

In this patient's culture, Prevotella intermedia was not sensitive to penicillin because it often produces beta-lactimase which inactivates penicillin. Some P. intermedia species are also resistant to metronidazole necessitating the use of Augmentin which contains clavulanic acid which inhibits beta-lactimase. This patient also had high levels of Enteric gram negative rods which are not sensitive to the common empirical choice of amoxicillin and metronidazole and required the additional use of ciprofloxacin.

Antibiotic Prophylaxis for Cardiac Patients

Adapted from Goodchild, Jason H
Drug Classes Every Dentist Should Know,
Module 1: Antibiotics, Western Schools, 2016

The latest American Heart Association (AHA) recommendations for the dental management of patients with cardiac abnormalities were published in 2007. These guidelines define patients at risk for endocarditis (See Table 1 on the next page), and the appropriate antibiotic regimen they should receive for prophylaxis (See Table 2 on the next page). Since these new recommendations were published, there has been no increase in the incidence of endocarditis. (Journal of the American Medical Society, April 25, 2017)

The dental procedures most likely to put patients at risk for endocarditis include all dental procedures that involve manipulation of gingival tissue or the periapical region of teeth, or perforation of the oral mucosa, including intraligamentary and intraosseous anesthetic injections.

The following procedures and events **do not require prophylaxis:**

- Routine anesthetic injections through non-infected tissue.
- Taking dental radiographs.
- Placement of removable prosthodontic or orthodontic appliances.
- Adjustment of orthodontic appliances.
- Placement of orthodontic brackets.
- Shedding of deciduous teeth, and
- Bleeding from trauma to the lips or oral mucosa.

Table 1

Cardiac Conditions Associated With the
Highest Risk of Adverse Outcome from Endocarditis
for Which Antibiotic Prophylaxis **is Recommended**

- Prosthetic cardiac valve
- Previous infectious endocarditis
- Congenital heart disease (CHD) conditions described below
- Unrepaired cyanotic CHD, including palliative shunts and conduits
- Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first six months after the procedure
- Repaired CHD with residual defects at the site, or adjacent to the site, of a prosthetic patch or prosthetic device (which inhibit endothelialization)
- Cardiac transplantation recipients who develop cardiac valvulopathy
- Except for the conditions listed above, antibiotic prophylaxis is no longer recommended for any other form of CHD.

Prophylaxis is not indicated for implanted pacemakers, coronary stents, or coronary bypass surgery.

Table 2

American Heart Association Recommendations for
Antibiotic Prophylaxis for Patients at Risk of Endocarditis

Single dose 30-60 minutes prior to procedure

Situation	Antibiotic	Adults
Oral	Amoxicillin	2 gm
Allergic to penicillin and able to tolerate oral therapy	Cephalexin (if no history of penicillin anaphylaxis)	2 gm
	Clindamycin	600 mg
	Azithromycin	500 mg
	Clarithromycin	500 mg

Antibiotic Prophylaxis for Orthopedic Patients

There are approximately one million total hip and knee replacements performed in the United States each year. The reported infection rate ranges from one to two percent, often with serious consequences.

Historically, orthopedists recommended routine antibiotic prophylaxis for all patients with prosthetic joints with no time limit.

While virtually all dental procedures can cause bacteremia, oral bacteremias also occur much more frequently when eating, flossing, and brushing. The chance of oral bacteremia from dental procedures causing joint infection is extremely low, with no evidence of its association.

Antibiotics have their own well-known problems. This has led to developing three different sets of guidelines over the past four years to address this issue.

"Given the lack of clear and distinct recommendations in consistently managing these patients, a panel of experts convened by the American Dental Association (ADA) Council on Scientific Affairs developed an evidence-based clinical practice guideline on the use of prophylactic antibiotics in patients with prosthetic joints who are undergoing dental procedures. The 2014 panel concluded that, in general, for patients with prosthetic joint implants, prophylactic antibiotics are not now recommended prior to dental procedures to prevent prosthetic joint infection." (Goodchild 2016) Notably, a 2016 consensus statement from Canada also recommended against prophylaxis.

Because of the lack of clarity on the specific circumstances where prophylaxis may be indicated, another panel was convened in 2016. The following criteria were identified as to when prophylaxis may be appropriate. (Journal of the American Dental Association [JADA], February 2017)

1. Immunocompromised patients (patients with HIV or AIDS, and patients on chemotherapy or methyltrexate)
2. Patients with uncontrolled diabetes

3. Patients with a history of previous joint infection which required surgery.

4. Time since surgery of less than one year.

The American Academy of Orthopedic Surgeons (AAOS) has released an Appropriate Use Criteria (AUC), available through www.orthoguidelines.org/auc, which goes through many scenarios to provide guidelines on when antibiotic prophylaxis may be appropriate. It basically uses the four criteria outlined in the JADA article above.

The JADA article added: "It is appropriate for the dentist to make the final judgment to use antibiotic prophylaxis for patients potentially at higher risk of experiencing prosthetic joint infection (PJI) (independent of dental treatment) using the AUC as a guide, and without consulting the orthopedic surgeon. However, if the orthopedic surgeon recommends antibiotic prophylaxis, or the patient prefers it despite the dentist's recommendation against prophylaxis, it is most appropriate for the surgeon to recommend the appropriate antibiotic regimen and, when reasonable, write the prescription."

Despite these new guidelines, in an article published April 1, 2017, in Journal Watch, the editor Allan Brett, MD reported on his personal survey of a number of orthopedists and dentists "that most orthopedists will continue to recommend prophylactic antibiotics for at least several years after joint replacement surgery, and that most dentists will defer to their patients' orthopedists."

Obviously, some controversy still exists. If there is any doubt, it is still probably best to consult with the patient's orthopedist.

If prophylaxis is indicated, the appropriate antibiotic regimens are similar to the American Heart Association's cardiac recommendations:

1. Amoxicillin 2 gm one hour before the procedure.

2. **Except Clindamycin is no longer recommended for orthopedic prophylaxis**

3. The optional antibiotics for penicillin-allergic patients are cephalexin (Keflex) 2 gm instead of clindamycin, then azithromycin 500 mg or clarithromycin 500 mg. **According to the AAOS, cross-reactivity of Keflex in patients with penicillin allergy is five percent, so this drug can be prescribed, unless there is a history of anaphylaxis with penicillin administration.**

What Medications to Prescribe for Orofacial Pain

The appropriate pain medication for oral pain depends upon how much pain the patient is having. **Consult drug texts for additional drug interactions and contraindications before prescribing.**

For Mild Pain, Prescribe:

1. Ibuprofen (Advil, Motrin) 200-400 mg, one to two tablets every four to six hours, or naproxen (Aleve) 220 mg, one to two tablets every eight hours.
   A. These two drugs are similar, non-steroidal anti-inflammatory drugs (NSAIDS), and are not to be taken by patients taking any anticoagulant drugs.
   B. For patients taking low dose aspirin, NSAIDS should be taken one hour after taking the aspirin to prevent blocking the aspirin.
   C. Do not prescribe if patients are either allergic to aspirin or have kidney damage.
   D. These drugs increase the risk of heart attack, stroke, and kidney damage, especially if taken in larger doses, even in the first week.
   E. Use with caution in patients with ulcers, on anticoagulants, or a history of gastrointestinal bleeding. Fatal bleeding events have occurred. Patients should stop taking these drugs if a stomach upset occurs.
   F. **Ibuprofen dose should not exceed 2400 mg per day.**
   G. These drugs an also be prescribed preoperatively to reduce postoperative pain. Dexamethasone 4 mg given 30 minutes before the procedure can also be included for larger surgeries.
   H. Use is contraindicated in the third trimester of pregnancy.

2. Acetaminophen (Tylenol) 500 mg, one to two tablets every six hours.
   A. Do not exceed 4000 mg each day.
   B. **Because of a different mechanism of action, it can be combined with ibuprofen or naproxen for additional synergistic pain relief.**
   C. Do not combine with other acetaminophen-containing products, such as Vicodin, Percocet, Ultracet, Nyquil, etc.
   D. Do not prescribe for patients with liver damage.

E. **Severe liver damage, including death, has occurred when more than 4000 mg are taken, especially if combined with alcohol.**
F. Can be prescribed even if the patient is on anticoagulants or allergic to aspirin or NSAIDs.
G. Higher doses over more than ten days may increase the risk of bleeding in patients taking warfarin (Coumadin).

3. Celecoxib (Celebrex) 100 - 200 mg two times per day. A highly selective cycloxygenate Cox-2 inhibitor (NSAID) that produces less stomach toxicity and upset than ibuprofen or naproxin. (See page 59.)
   A. Avoid higher doses or prolonged use which may increase the risk of heart attack.
   B. Avoid prescribing in patients with preexisting heart disease.
   C. Can be prescribed for patients allergic to aspirin or ibuprofen (Cox-1 inhibitors), or at risk of stomach bleeding from anticoagulants.

For Moderate Pain, Prescribe:

A Marcaine local anesthesia block or infiltration can be given at the end of the procedure if moderate or severe pain is anticipated.

1. Ibuprofen, 600 mg, one tablet every four to six hours as needed
   A. Doses over 600 mg have not been shown to increase pain control.
   B. Pre-operative use of 600 mg one hour before a surgical appointment has been shown to relieve pain and reduce swelling after.

2. If pain persists, add acetaminophen (Tylenol) 500 mg to the ibuprofen. These two pain medications are synergistic.

3. Tramadol 37.5 mg plus acetaminophen 325 mg (Ultracet)
   A. Prescribe one to two tablets every four to six hours.
   B. Do not exceed eight tablets in 24 hours or combine with acetaminophen or other acetaminophen-containing products.
   C. Avoid prescribing tramadol if the patient has a history of seizures or central nervous system disturbances, is taking antidepressants, or has pulmonary disease.
   D. Patients should not drive while taking tramadol.

For Severe Pain, Prescribe:

Ibuprofen 600 mg and acetaminophen 500 mg have been shown to be superior to opioids for severe pain and should be prescribed first (Moore et al, JADA 2013). The opioids listed below can be prescribed for the patient to fill on an "as needed basis" as a rescue medication.

1. Hydrocodone 5 mg and acetaminophen 300 mg (Vicodin), one or two tablets every four to six hours as needed for severe pain, not to exceed eight tablets in 24 hours. Some new formulations have 300 mg acetaminophen, but are much more expensive.

2. Oxycodone 5 mg and acetaminophen 325 mg (Percocet), one to two tablets every four to six hours as needed, not to exceed eight tablets in 24 hours.

Patients should not drive or consume alcohol when taking either of these medications. These medications can be combined with ibuprofen or naproxen for additional pain control. Nausea is common with these narcotic medications. Taking with food is helpful to reduce nausea. If nausea continues, they should be discontinued. Taking over-the-counter Emetrol will help the nausea.

Side Effects and Pharmacology of Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)

Summarized from The Medical Letter, December 19, 2016
and the Cleveland Clinic Arthritis Advisor, March 2017

Nonsteroidal anti-imflammatory drugs (NSAIDS) can be effective, but they are not completely benign. There are possible side effects, most commonly stomach problems. This can occur, at least in part, because most NSAIDS, such as ibuprofen and naproxen, work by inhibiting the cyclooxygenase (COX) enzymes, COX-1 and COX-2, which are required for synthesis of prostaglandins and thromboxane.

The **COX-1 enzyme** helps protect the stomach lining. Inhibiting COX-1 blocks the protective effect of prostaglandins on the gastric mucosa, which can cause gastrointestinal toxicity, and has an antiplatelet effect that can cause bleeding. Blocking COX-1 can leave the stomach vulnerable to damaging effects of stomach acid, which may lead to ulcers and other problems. Ibuprofen and naproxen inhibit COX-1 more than COX-2.

The **COX-2 enzyme** causes pain and inflammation. Inhibiting COX-2 produces therapeutic anti-inflammatory and analgesic effects, but it has effects on vascular endothelium that can be prothrombotic.

The COX-2 selective NSAID, rofecoxib (Vioxx), inhibits COX-2 80 times more than COX-1. It was removed from the market because of cardiovascular toxicity.

Celecoxib (Celebrex), which inhibits COX-2 nine times more than COX-1, also has been associated with an increased risk of cardiovascular toxicity, but much less than Vioxx.

The COX-2 inhibitor celecoxib (Celebrex) may be a good option for people with a history of ulcer or other gastrointestinal upset, but also may cause stomach upset in some patients because of a small amount of COX-1 prostaglandin inhibition.

COX-2 selective NSAIDs like Celebrex cause less gastrointestinal toxicity and bleeding than non-selective NSAIDs, but they may have a prothrombotic effect, and all NSAIDs are nephrotoxic. **All NSAIDs increase the risk of myocardial infarction, even in the first week. Elderly patients who are most at risk should exercise caution in taking any NSAID, including celecoxib.**

NSAIDs also inhibit renal prostaglandins, decrease renal blood flow, cause fluid retention, and may cause hypertension and renal failure, especially in the elderly.

Dr. Elaine Husni of the Cleveland Clinic emphasizes that occasional users of NSAIDs should not worry about heart disease. “People who take the drugs chronically, especially those who have heart disease, should be monitored by their physician.”

Managing Patients on Anticoagulants Who Need Oral Surgery

Reference: Wynn et al, ***Drug Information Handbook***, 2016, pages 1790-1796
With Thanks to Dr. Mike Chizner, MD, for Information about
Oral Platelet Therapy for Coronary Artery Stents

In most cases, no change in medication is necessary. Stopping anticoagulation medications before dental surgery creates a far greater risk of serious, potentially fatal events than the risk of bleeding during dental procedures.

For periodontal therapy with the Nd:YAG Laser (LANAP), adjustment of anticoagulant therapy is hardly ever needed since this laser seals the blood vessels.

Many patients with atrial fibrillation, artificial heart valves, and clotting disorders are on anticoagulant therapy to prevent strokes and embolisms.

With warfarin (Coumadin), the prothrombin time can be adjusted to an International Normalized Ratio (INR) of 3.0 before minor dental surgery, below 2.4 for larger surgeries, and below 2.0 for full mouth extractions.

Patients taking warfarin should avoid aspirin and NSAIDS like ibuprofen, naproxen, and metronidazole, which increase the INR further.

Newer anticoagulant drugs are now being prescribed to replace warfarin for prevention of strokes or blood clotting in patients with atrial fibrillation. These include dabigatran (Pradaxa), rivaroxaban (Xarelto), apixaban (Eliquis), and edoxaban (Savaysa).

The INR test does not work for these medications, and monitoring is not currently possible. Since these new agents have a predictable effect, and the effect is short term, monitoring is not necessary. For uncontrolled bleeding, reversal agents for these medications have recently been developed. For larger surgeries, these medications can be stopped 36 hours before and resumed one day after, with physician approval. With these medications, aspirin and NSAIDS like ibuprofen and naproxen double the risk of a major bleed and should be avoided.

Commonly, those individuals at moderate risk of heart attacks are taking aspirin daily. **Daily aspirin use seldom, if ever, should be adjusted before dental surgery, as that creates a rebound effect which increases the risk of strokes or heart attacks by approximately three times.**

Other medications that affect platelet aggregation include clopidogrel (Plavix), prasugrel (Effient), ticagrelor (Brilinta) and ticlopidine (Ticlid).

Normal platelet aggregation returns only when new platelets are produced five to nine days after stopping antiplatelet drugs.

Those patients who have had a stent in a coronary artery usually take a combination of aspirin and clopidogrel (Plavix) or prasugrel (Effient) to prevent reclotting of the stent. **The FDA has warned that stopping this dual drug therapy greatly increases the risk of stent thrombosis and heart attack and/or death.**

Elective procedures with a high risk of bleeding should be postponed until the dual platelet therapy is completed, usually six to 12 months after placement of the drug-eluting stent. Patients with stable heart disease, or who have a bare metal stent, often can stop the dual platelet therapy after three months. All stent patients should continue on 81 mg aspirin daily for a lifetime.

Numerous herbal medicines and natural dietary supplements also have anticoagulant effects, including garlic, feverfew, ginkgo biloba, vitamin E, and fish oil.

To help control bleeding, patients can rinse with the antifibrinolytic, tranexamic acid, 4.8 percent 100 ml one teaspoon one hour before appointment, immediately after treatment, and then four times per day for two days. Do not eat or drink for 20 minutes after rinsing. It works by preventing blood clots from breaking down too quickly. This can be made up by a local compounding pharmacy. For localized bleeding, Gelfoam, Avitene, and Surgicel are also helpful.

In all cases, consultation with the patient's prescribing physician is indicated before adjusting anticoagulant medications.

See the next page for a comparison of anticoagulant and antiplatelet drugs with their mechanism of action.

Comparison of Oral Anticoagulants

Medication	Mechanism of Action
Warfarin (Coumadin)	Inhibits formation of vitamin K-dependent clotting factors Adjust INR to 2.4 or below for most surgeries
Dabigatran (Pradaxa)	Directly inhibits thrombin
Edoxaban (Savaysa) Rivaroxaban (Xarelto) Apixaban (Eliquis)	All of these medications directly inhibit Factor Xa. **With physician approval, stop for 36 hours before surgery and resume one day after.**

Comparison of Oral Antiplatelets

Medication	Mechanism of Action
Aspirin	Inhibits cyclooxygenase 1 and 2 Stay on for almost all procedures
Cilostazol (Pletal)	Inhibits platelet phosphodiesterase III
Vorapaxar (Zontivity)	Inhibits PAR I
Clopidogrel (Plavix) Prasugrel (Effient) Ticagrelor (Brilinta) Ticlopidine (Ticlid)	Inhibit $P2Y_{12}$ component of ADP receptors Do not discontinue if taking after a cardiac stent

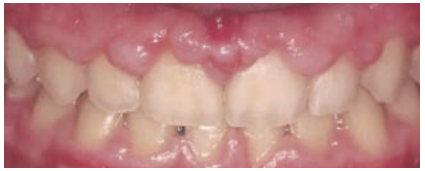
Avoid taking NSAIDS, like ibuprofen and naproxen, with all these medications.

Gingival Hyperplasia Related to Calcium Channel Blockers and Other Medications

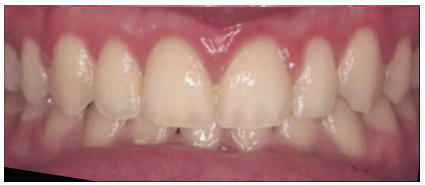
Calcium channel blockers are named for their ability to block the movement of calcium across mechanical channels in heart and artery walls. This causes vasodilation which reduces blood pressure. They are also used to treat angina and fast irregular heart rhythms. There are at least eleven channel blockers with different generic and trade names, which can be quite confusing. (See next page.)

Nifedipine (Procardia) has the highest reported incidence of gingival hyperplasia, followed by diltiazem (Cardizem), amlodipine (Norvasc) and verapamil (Calan).

Switching to a different drug in the same class like isradipine (Dynacirc), or reducing the dose of amlodipine to 5 mg, has been reported to reduce the hyperplasia. Other drugs that frequently cause hyperplasia are cyclosporine, an immunosuppressant, and phenytoin (Dilantin), an anticonvulsant. (See next page.) Orthodontic treatment sometimes results in hyperplasia. (See below.)



A teenager with severe gingival hyperplasia after orthodontics.



The same teenager's smile one month after laser crown lengthening.

Medications Which Cause Gingival Overgrowth

Calcium Channel Blockers (Listed in Order of Reported Frequency of Overgrowth)	Trade Name
Nifedipine	Adalat, Nifecard, Procardia, Tenif
Diltiazem	Cardizem, Dilacor, Diltiamax, Tiazac
Amlodipine	Lotrel, Norvasc
Verapamil	Covera-HS, Calan, Verelan
Felodipine	Plendil
Nitrendipine	Baypress
Nicardipine	Caardene
Manidipine	Manyper
Nimodipine	Nymalize
Nisoldipine	Sular
Isradipine	Dynacirc
Immunosuppressants	
Cyclosporine	Neoral, Sandimmune, Restasis
Tacrolimus	Protopic, Prograf
Sirolimus	Rapamune
Anticonvulsants	
Phenytoin	Dilantin, Phenytek
Sodium valproate	Depakote, Depakene, Stavzor

Managing Medical Emergencies Which Arise During Dental Treatment or Elsewhere

The first step is diagnosis. The primary serious and potentially fatal problems that can occur during dental treatment or anywhere are:

1. Myocardial infarctions — heart attacks
2. Cardiac arrest
3. Strokes — brain attacks
4. Anaphylaxis

Myocardial Infarction

Myocardial infarction (heart attack) occurs in three million people each year in the United States. It is very important to know the warning signs and act promptly before an almost always fatal cardiac arrest occurs. **It is quite common for people to be in denial and not seek medical attention, a potentially fatal mistake. Sudden death is not so sudden. There are almost always warning signs:**

1. Pain or pressure under the sternum or in the center of the chest brought on by exercise and relieved by rest. It may also occur only at rest.

2. Fatigue and/or sudden sweating, nausea, and lightheadedness.

3. Shortness of breath with or without chest discomfort.

4. Referred pain to the left arm, lower jaw or other areas.

Call 911 early, get an Automated External Defibrillator (AED), give the patient nitroglycerin spray if not on Viagra or Cialis, and have the patient chew an aspirin (320 mg) if not allergic.

Early treatment with medication, lifestyle changes, stents, and bypass surgery can prevent progression to cardiac arrest and death.

Cardiac Arrest

Cardiac arrest occurs in 200,000 people each year. It will often occur sometime after the warning signs for myocardial infarction. In cardiac arrest, it is critical to begin CPR immediately and get an AED on to shock the heart in the first two to three minutes. The heart will stop fibrillating in five minutes, and brain death starts in four minutes. Cardiac arrest is reversible if treated in the first five minutes.

The average time for emergency medical services (EMS) technicians to arrive on the scene is eight minutes, so people are already dead unless defibrillated by someone who witnessed the arrest. The survival rate for defibrillation provided within three minutes has been reported to be as high as 74%. The survival rate for cardiac arrest victims treated by EMS technicians outside a hospital is 9.4 percent and may be even lower. This tells us if the person is going to survive, it is up to us. In most cases, EMS personnel simply transport the body to the hospital to be pronounced dead, or occasionally, to be resuscitated with serious brain damage.

The **four key steps to save a life are:**

Think A B C D:

1. Shake and Shout! Are you OK? Check that the **Airway** is clear.
2. Is the victim **Breathing?** If not, send for an AED and call 911.
3. If the victim is not breathing, start hard, deep, and fast **Chest Compressions** with full recoil at 100 beats per minute on the sternum midway between the nipples. Except in infants and drowning victims, breaths are not necessary since there is enough oxygen in the blood for seven to eight minutes.
4. **As soon as the AED arrives — two minutes! — turn it on and follow the prompts to Defibrillate.** Remove the victim's shirt and apply two pads upper right and lower left. The AED will automatically analyze the rhythm and defibrillate if indicated.

If vital signs return, great! If not, begin hard and fast chest compressions, 30 compressions, then two breaths that make the chest rise for two minutes (five cycles), then the AED will automatically defibrillate again if needed until EMS personnel arrive.

Stroke

Strokes (brain attacks) kill or seriously disable 820,000 people each year. Again, early recognition of warning signs like transient ischemic attacks (mini strokes) are key to preventing a major stroke. Treating atrial fibrillation with blood thinners (see page 64) is also important to prevent strokes.

In case of a stroke, diagnosis is the key. STRoke is used to make the diagnosis.

Smile — Does one side droop?
Talk — Are the words slurred?
Raise both arms — Is one arm weak?

Do not give an aspirin to someone you suspect is having a stroke since aspirin will exacerbate a stroke caused by bleeding.

Early treatment with clot-dissolving drugs and stents in the cranial arteries can increase survival and reduce disability.

Anaphylaxis

Anaphylaxis is another common medical condition that can cause death if not treated early. There are 200,000 anaphylactic incidents each year. The allergic reaction to medications like penicillin, bee or fire ant stings, latex, and foods like peanuts and eggs are the major cause of anaphylaxis.

Again, **early recognition of a severe breathing problem, dizziness, and passing out are key. Treatment is an EpiPen 1:1000 epinephrine injected into the thigh and held for ten seconds.** Then call 911 and give the EpiPen injection again in five minutes if the patient is non responsive. Note: a less expensive generic version of EpiPen is now available.

The bottom line in these four life-threatening conditions is: if the person is going to be saved, it's up to us. If it's going to be, it's up to me!

About the Authors

Meet the Authors: Who Are Drs. Tom and Mark McCawley?

Father and son periodontists that live their mission every day "Saving Lives by Saving Smiles." A family practice serving the periodontal and implant needs of Broward County for over 40 years by treating patients like family, giving them the latest leading edge treatments in the most gentle way.

Meet Dr. Tom McCawley, DDS, FACD

Dr. Tom McCawley has practiced in Fort Lauderdale for more than 40 years. A graduate of the University of Illinois College of Dentistry, Dr. McCawley holds a specialty degree in Periodontics from Boston University School of Graduate Dentistry. He is co-chairman of Clinical Periodontics at the Broward College Dental Research Clinic, and a Fellow of the prestigious American College of Dentists.

He is the past-president of the Florida Association of Periodontists, the Broward County Dental Society, and the North American Society of Periodontists.

Dr. McCawley lectures frequently to universities and dental groups throughout the country and internationally on "Periodontics for the 21st Century – The Latest Advances in Anti-Infective Therapy," on laser therapy, and on Practice and Life Management.

He has presented new groundbreaking research on laser effects on bacteria to the American Academy of Dental Research, the American Academy of Periodontology, and the North American Society of Periodontists. Drs. Tom and Mark McCawley recently co-authored two new studies on Laser-Assisted New Attachment Procedure (LANAP), including a groundbreaking study proving that the laser killed the disease-causing bacteria in infected pockets. These studies make them among the leading researchers in the world on minimally-invasive laser periodontal treatment. For this research,

Dr. Tom McCawley and Dr. Mark McCawley were awarded the LANAP Protocol Hero Medal at the American Academy of Periodontology 2016 LANAP Study Club meeting.

In 2009, at the height of the financial crisis, Dr. Tom McCawley published a book to help young dentists and others with their life balance and finances. His book – *The 4 Simple Secrets to Avoiding Life's BIG Financial MESSTAKES – REDISCOVERING the Simple Secrets to a Great Income, Financial Independence and Most Importantly, A GREAT LIFE!* – has sold over 2,000 copies. Dr. McCawley has donated over 1,000 copies to dental students at Nova Southeastern University and to many others.

Dr. Tom McCawley and Dr. Mark McCawley recently wrote two books, *A Patient's and Clinician's Guide: Saving Your Teeth, Implants and Your Health,* and *A Clinician's Guide: Diagnosing and Treating Oral Diseases and Orofacial Pain, Including Medications and Medical Guidelines*. Both are available at the office, downloadable at mcccawley.com, or from Amazon. These books answer many questions about periodontal disease, implants, oral diseases, and orofacial pain.

For recreation, Dr. McCawley likes to play tennis, exercise, read, write, travel, and spend time with family.

"How wonderful and compassionate, Dr. McCawley is and what an excellent doctor. The hundreds of doctors I have seen in my life, totaled, have not 1/100th the compassion he has."

Christine Jones, Lighthouse Point, FL

"I have suffered from gingivitis for a long while. Without effective treatment, the gingivitis became worse, turning into periodontitis. I lost teeth and had bone deterioration. Recently I was fortunate to be cared for by Dr. McCawley and his staff.

For treatment, Dr. McCawley used the Laser-Assisted New Attachment Procedure (LANAP). Now I have much healthier teeth and gums. During the entire process of treatment I had only minimal discomfort. In addition to the procedure going smoothly, the office experience was very pleasant.

I would strongly recommend Dr. McCawley for whomever needs periodontal treatment."

Peter Tsai, Plantation, FL

Meet Dr. Mark McCawley, DMD, MS
Board Certified Periodontist

"From father to son, so it goes on."
African Proverb

Dr. Mark McCawley is a lifelong resident of Fort Lauderdale. He attended Harbordale Elementary and Pine Crest School, where he was Captain of the cross country team. He graduated cum laude from Florida State University. He received his D.M.D. degree from Nova Southeastern University College of Dental Medicine. He then went on for a three-year residency in periodontology and implants, and received a Certificate of Advanced Graduate Study and a Master of Science degree from Nova. He is a Board Certified Periodontist and serves on the executive council of the Broward County Dental Society.

Drs. Tom and Mark McCawley spent four days placing implants in very grateful underserved patients in Mexico.

He is trained and certified in the Pinhole Surgical Technique, a minimally-invasive treatment for gingival recession, and has appeared on Miami Channel 7 television news with Dr. Chao, the inventor of the technique. He is also trained in the Laser-Assisted New Attachment Procedure (LANAP), and has two published research studies on LANAP. For this research, Dr. Mark McCawley and Dr. Tom McCawley were awarded the

LANAP Protocol Hero Medal at the American Academy of Periodontology 2016 LANAP Study Club meeting. Dr. Mark McCawley has lectured on this research to the American Academy of Dental Research and to the North American Society of Periodontists.

Dr. Mark McCawley has taken additional advanced training in implant placement and implant-related bone grafting and sinus surgery from the Global Dental Implant Academy in California. In addition, he lectured on managing peri-implantitis with the Laser-Assisted Peri-Implantitis Procedure (LAPIP) at the Academy's USA Symposium 2017. He has taken over the dental implant part of our practice.

Along with Dr. Tom McCawley, Dr. Mark McCawley emphasizes treating the microbiological cause of periodontal disease, not just the resultant pockets. Both Dr. Mark McCawley and Dr. Tom McCawley use minimally-invasive therapies, such as lasers and Pinhole surgery, in a gentle manner, using sedation where indicated for anxious patients.

In his free time, he likes to play golf, tennis, travel, and spend time with family and friends.

"Many people use the word excellence too freely when describing their services. Yours is the rare case where it actually applies."
Vinnie St. John, Plantation, FL 5 out of 5 stars

"Dr. Mark McCawley is a periodontist's periodontist! He is all about saving teeth, where others want to just pull teeth. I had a second opinion from a doctor who wanted to treat my infection just by pulling two of my teeth. Dr. Mark took cultures to figure out how to treat my infection, and then by using the LANAP laser technique (which many periodontists do not have) saved my teeth!! Also, it is my understanding that this type of treatment is a much more pleasurable experience. I can tell you first hand, the pain is minimal. What also made the experience better was the incredible staff which works in the office. In my opinion, you cannot get a more professional, caring office with the most up-to-date equipment! If you're looking for a periodontist that cares about saving teeth, and is extremely up-to-date with all the latest procedures, look no more!!"
Alan Wuensch, Cooper City, Florida

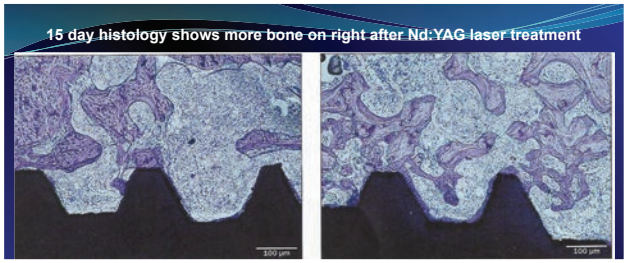
Appendix

Biologic Response of Implants to Nd:YAG Laser Treatment

Biologic Response to Titanium Implants with Nd:YAG Laser-Treated Surfaces

Allegrini et al, Int J OralMaxillofac Implants, Jan, 2014

- 60 titanium mini-implants placed in the femora of rats, 30 roughened with the laser
- Conclusions: the roughness obtained on implant surfaces treated with the laser promoted better bone repair and better bone contact than did machined implant surfaces.



Machined group specimen at 15 days. The space between the threads of the screw can be seen with little trabecular bone approximation.

Laser group specimen at 15 days. A greater amount of new bone deposition can be observed.

Errors to Avoid in Diagnosing and Treating Oral Diseases and Orofacial Pain

See red bolding throughout the book,
and the page numbers referenced in this chapter
for a more detailed explanation.

1. Page 9: Confusing aphthous ulcers with herpes. Herpes (cold sores) occur on the lips. Aphthous ulcers occur on movable tissue inside the mouth.

2. Page 12: Failing to properly diagnose and treat primary herpes infection which occurs more commonly in younger people. It causes very painful ulcerations throughout the mouth, including often in the throat. Fever and swollen lymph nodes often occur.

3. Page 12: Not being aware that chlorhexidine can occasionally cause a serious, rarely fatal, allergic reaction.

4. Page 15: Overlooking oral cancer and not biopsying suspicious lesions. Especially check the back of the tongue and the throat for cancer caused by Human Papillomavirus (HPV).

5. Page 17: Focusing on treating the results of periodontal infection – the pockets – not on the bacterial cause of the pockets.

6. Page 21 and 23: Failing to tell patients periodontal disease is transmissible from significant others, pets, and travel to the Caribbean – the likely source of their original infection, and a possible source of reinfection after periodontal treatment.

7. Page 25 and 26: Increasing patients risk of a first heart attack, and many other systemic diseases, by not diagnosing and treating periodontal disease.

8. Page 27 and 29: Not informing patients that implants are just as susceptible as teeth to periodontal infection and bone loss.

9. Page 31 and 42: Not informing patients about the risk of caries and root sensitivity from frequently eating lots of fruit. The fructose and acidic pH contributes to these problems.

10. Page 33: Not examining the very back of the tongue for tongue coat, which is the major cause of most halitosis, and which can also contribute to the recurrence of periodontal disease infection.

11. Page 37 and 38. Confusing periodontal abscess pain with pulpal pain. Pulpal pain is usually more severe and not localized. Periodontal pain requires a pocket of at least 5 mm and usually more, and can usually be localized by the patient. (Also see Chart of Tests for a Differential Diagnosis of Orofacial Pain on pages 84 and 85.)

12. Page 45. Extracting teeth or performing osseous surgery on a patient taking an oral or intravenous bisphosphonate. Drug-induced osteonecrosis of the jaws can lead to jaw fractures and significant morbidity.

13. Page 51. Errors in prescribing antibiotics:
    - Prescribing penicillin or amoxicillin for someone taking methotrexate
    - Prescribing metronidazole for someone taking warfarin, or who has a central nervous system disorder
    - Prescribing ciprofloxicin for a dental infection without a clear indication and possibly a culture
    - Prescribing azithromycin (Z-PAK) for patients with cardiac arrhythmia or taking amiodarone (Cordarone)

14. Page 54: Prescribing antibiotic prophylaxis before dental procedures for patients with pacemakers, stents or coronary bypasses.

15. Page 56: Prescribing clindamycin prophylaxis for a patient with a recent prosthetic joint replacement.

16. Page 56: Being unaware Keflex can be prescribed in most patients with penicilllin allergy, unless they have a history of anaphylaxis.

17. Page 57: Prescribing ibuprofen 800 mg QID for pain, which exceeds the 2400 mg per day recommended maximum, which can lead to kidney damage and myocardial infarction.

18. Page 57: Prescribing acetaminophen with other acetaminophen-containing products, thereby exceeding the 4000 mg maximum dose, which can lead to severe liver damage.

19. Page 59: Not prescribing ibuprofen 600 mg plus acetaminophen 500 mg first, before prescribing a narcotic for pain.

20. Page 61: Not being aware that non-steroidal, anti-inflammatory drugs increase the risk of myocardial infarction, and should be used with caution in patients with heart disease.

21. Page 63: Taking patients off of aspirin before dental surgery.

22. Page 63: Taking patients with drug-eluting stents off any anticoagulant drug six to 12 months after stent placement before dental surgery.

23. Page 64: Prescribing ibuprofen or naproxen for patients taking any anticoagulant.

24. Page 64: Stopping the new anticoagulants for longer than 36 hours before any dental surgery.

25. Page 66: Not being aware of the many medications which can cause gingival hyperplasia.

26. Page 67: Ignoring the many signs of an impending myocardial infarction in ourselves and our patients, a potentially fatal mistake.

27. Page 68: Not being aware that the average time for emergency medical services (EMS) technicians to arrive on the scene of a cardiac arrest is eight minutes – too late to save almost all patients who have a cardiac arrest.

28. Page 68: Not being aware that we must defibrillate a patient in cardiac arrest within five minutes with an automated external defibrillator (AED), or the chance of survival drops to almost zero.

29. Page 69: Not having an EpiPen or other source of 1:1000 epinephrine available to use if an anaphylactic reaction occurs in our offices.

30. Page 69: Not being aware that giving an aspirin to someone you suspect is having a stroke will exacerbate a bleeding stroke.

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Chart of Tests for a Differential

Diagnosis:	Periodontal Abscess	Pulp Necrosis	Cracked Tooth
Tests:			
Cold (Endo Ice)	Normal	No	Often Yes
Percussion	Yes or No	Yes or No	Yes or No
X-ray/ CT Scan	Lateral Bone Loss Usually Evident	Sometimes Apical Lesion	Sometimes Visible
Bite Stick	No	No	Yes
Probing	>5 mm	No	No
Symptoms	Localized, Dull, Continuous Pain, Swelling	None	Sharp Pain When Biting And Usually Cold Sensitivity
Treatment	Curet, Local Antibiotics, Periodontal Treatment	Endodontic Treatment	Crown, Possible Endodontic Treatment

Diagnosis of Orofacial Pain

Periapical Abscess	Irreversible Pulpitis	Root Sensitivity	Sinusitis
No	Prolonged Pain from Cold, but Especially from Heat	Yes (Short)	No
Yes	Yes or No	No	Yes
Usually Apical Lesion CT Scan	No	No	Yes CT Scan
No	No	No	No
If Fistula, Trace With Gutta Percha Cone to Root Apex	No	No	No
Spontaneous Severe, Throbbing Pain Not Localized, Possible Swelling	Pain from Hot or Cold Lasting 30 to 60 Seconds	Instant Pain from Cold That Doesn't Last	Tender to Pressure over Sinus, Stuffy Nose, Presssure When Bending Over
Antibiotics, Endodontic Treatment	Endodontic Treatment	Desensitization	Antibiotics, MD Referral

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