

# Journal

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## DEPARTMENTS

- 5 The Editor/My Microbiome and Me
- 7 Impressions
- 49 RM Matters/Top Seven Data Breach Considerations
- 55 Regulatory Compliance/HIPAA Security Rule Technical Safeguards
- 59 Periscope
- 64 Tech Trends
- 65 Dr. Bob/Protest Now



7

## FEATURES

- 17 UCSF Protocol for Caries Arrest Using Silver Diamine Fluoride: Rationale, Indications and Consent  
*This paper presents a systematic review, clinical indications, clinical protocol and consent procedure to guide application for caries arrest treatment using silver diamine fluoride.*  
 Jeremy A. Horst, DDS, PhD; Hellene Ellenikiotis, DDS; and Peter M. Milgrom, DDS
- 29 Periodontics and Oral-Systemic Relationships: Diabetes  
*It has been proposed that periodontal disease is a risk factor for systemic diseases. This paper explores its relationship to diabetes.*  
 Alison Glascoe, DDS, MS; Ronald Brown, DDS, MS; Grace Robinson, DDS; and Kassahun Hailu, DDS
- 35 Atypical Presentation of Zoster Mimicking Headache and Temporomandibular Disorder: A Case Report  
*This article reports on a case of trigeminal herpes zoster, which presented as sudden onset headache and acute temporomandibular pain in the prodromal phase.*  
 Mohammad Reza Zarei, DDS, MSc, and Goli Chamani, DDS, MSc
- 39 A National Survey of Positional Leadership Trajectories of U.S. Dentists  
*This paper extends the nascent work in understanding leadership among dentists.*  
 David Chambers, EdM, MBA, PhD

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# Journal

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# My Microbiome and Me

Kerry K. Carney, DDS, CDE

My mother likes to remind me that when she was a child, certain things did not exist or had not been invented. For my mother, this category is very broad and encompasses many things common to our world today. For example, it includes computers, plastic wrap, allergies and depression. (Allergies did not exist and depression had not yet been invented.)

Allergies and depression aside, her worldview does show us how rapidly our scientific understanding of the world has changed. It also allows us to hold hands with the past and “reach back” to a world experience very different from the one we know now. My mother and her classmates would not have had access to penicillin. Before its mass production in 1945, common childhood infections often resulted in death. Penicillin was a closely guarded secret that saved the lives of thousands of allied forces during World War II.

My mother was 8 years old when Fleming discovered penicillin in 1928. The microbiology that my parents learned in school was not far removed from Florence Nightingale’s miasmatic theory of contagion. I am amazed by the chasm of ignorance that separated the simple renderings of bacteria in my high school biology classes from the complex microbial colonies we studied in dental school. And today, I am fascinated by the descriptions of the microbial makeup and interactions of the human microbiome.

The human microbiome is “the ecological community of commensal, symbiotic and pathogenic microorganisms that literally share our body space.”<sup>1</sup> It is that collection of microorganisms that share our space and have an association with us that:



The human microbiome is “the ecological community of commensal, symbiotic and pathogenic microorganisms that literally share our body space.”

- Benefits them with no detriment to us.
- Benefits both of us.
- Benefits them and is detrimental to us.

These microbes outnumber the cells in our body by 10 to one. If you considered this collection of cells (your human microbiome and the cells that make up your body) as some kind of super organism, then only one tenth of that super organism would be made up of cells from your body.

When I first learned that, I thought I had at last found a satisfactory explanation for my weight gain and a potentially quick way to lose weight by divesting myself of those weighty microorganisms. It was disappointing to find that though our microbiome outnumbered us in cell count, their tiny size means they account for no more than three pounds per super organism.

The Human Microbiome project was launched in 2008. Following on the heels of the successful Human Genome Project, its goal was to describe by identifying and characterizing the community of microorganisms that are associated with the human body. The ultimate goal is to understand how the human microbiome interacts with the human body in states of health and disease.

The human microbiome focused on five areas of the body. Male subjects were sampled at a total of 15 sites and females were sampled at a total of 18 sites.

- The nose (one site sampled).
- The mouth (nine sites sampled: attached gingiva, hard palate, throat, palatine tonsils, dorsum of the tongue, buccal mucosa, supragingival and subgingival plaque and saliva).
- The skin (four sites sampled).
- The colon (one site sampled).
- The urogenital/vagina (three sites sampled).<sup>2</sup>

The importance of the mouth is clearly reflected in the number of sample sites selected. The oral sites make up 50-60 percent of the total microbiome samples.

The oral environment is unlike any of the other sample sites in its variety of substrates. It has solid surfaces (teeth, restorations of various materials, dentures, orthodontic appliances) and shedding surfaces (keratinized and nonkeratinized mucosa). In addition, “saliva contains around 100 million” microorganisms per milliliter.<sup>2</sup> The identification of all of the microorganisms in the oral sample is incomplete. Nor has verification of residence been completely established. Some numbers of the microorganisms are transients, just passing through.

In dental school, electron microscopy rendered complex and beautiful the colonies of microorganisms in oral plaque. However, those depictions look pretty simplistic when compared to the

populations identified in the human oral microbiome. “Currently, about 700 different bacterial species are identified in the human oral cavity, but estimates suggest that the number may be as many as 1,200.”<sup>2</sup> If clearly rendered, this cacophony of oral microorganisms might look like some weird mash-up of Hieronymus Bosch’s “Garden of Earthly Delights” and a page from “Where’s Waldo?”

The Human Microbiome Project has raised many questions. Is there a core human oral microbiome? How does the human microbiome change our ideas of health, infection, disease and the inflammatory process? Does a liberal or careless use of antibiotics

impact the microbiome of individuals or regions of individuals? How does our microbiome relate to seemingly unrelated conditions like obesity, drug effectiveness and diabetes? How does the oral microbiome change over time in the individual and in a population?

Genetic investigative technologies no longer rely on culturing microorganisms in the laboratory. We can get an idea of “who’s where” by analyzing small snippets of genetic material.

Do pathogenic microorganisms cause disease or do they take advantage of inflammatory response changes in the environment? The overgrowth of periodontal microbes may well

be a result of the periodontal tissue breakdown and not the cause of periodontitis.”<sup>2</sup> Our ideas of who the “bad guys” are may have to change.

Personalized medicine and treatment planning will become even more complex. The interaction of host and environmental factors along with a myriad of microbial community responses to inflammation will have to be taken into consideration in the evaluation of a patient’s oral health status and in the designing of therapy and treatment.

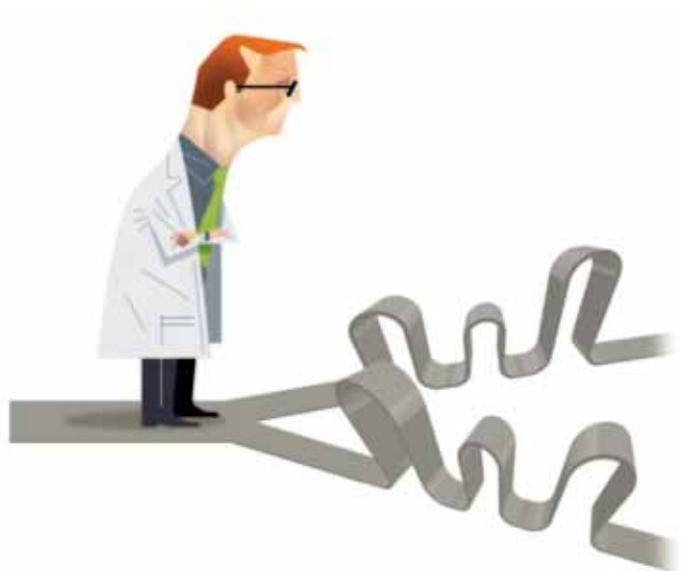
Should I reach the age of 95, I will look forward to telling my young dental colleagues, “You know the human oral microbiome did not exist when I began practicing. It had not been invented.”

Henri Bergson is attributed with having said, “The eyes see only what the mind is prepared to comprehend.” As we begin to understand the human oral microbiome we will see our patient’s oral health with new eyes and a more complex appreciation. That visual oral exam is about to become even more interesting. ■

REFERENCES

1. The NIH Human Microbiome Project. *Genome Res Dec 2009* 19(12): 2317-2323. [www.ncbi.nlm.nih.gov/pmc/articles/PMC2792171](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2792171).
2. Borgnakke WS. “The Traveling Oral Microbiome,” pp. 61-102 *The Oral-Systemic Health Connection A Guide to Patient Care*. Glick M ed. Quintessence Publishing Co. Inc.

The image shows a screenshot of the 'cda.org/social-hub' website. At the top right is the 'cda' logo. The main heading is 'cda.org/social-hub' in large white text on a dark background. Below this is a banner that says 'Let's socialize.' with the subtext 'Post, Like, Comment, Tweet, Favorite, Share, Connect'. The main content area displays a grid of social media posts from various dental professionals, including announcements about registration, dental news, and holiday greetings. To the right of the social media feed is a vertical column of social media sharing icons for Facebook, Twitter, YouTube, LinkedIn, Pinterest, and Google+.



The nub:

1. Do not confuse sophistication with soundness.
2. Because one has a right to do something does not mean that it is right to do it.
3. A good name for a questionable practice is still questionable.

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**David W. Chambers, EdM, MBA, PhD**, is professor of dental education at the University of the Pacific, Arthur A. Dugoni School of Dentistry, San Francisco, and editor of the *Journal of the American College of Dentists*.

## The Dilemma Dilemma

David W. Chambers, EdM, MBA, PhD

America continues to make impressive progress in the field of PC superlatives. This goes beyond renaming our ignorance. I have something more serious in mind such as free-range lettuce or gluten-free spam filters. A good name on an ambiguous practice does the trick. We live in a world of mind-numbing adverbs that tell us more about how we should feel than what is really so.

My current favorite in dentistry is “evidence-based.” Rough translation: “I think there are some published studies that meet some protocol requirements that support what I want to do in my practice.” We used to just say, “There are good reasons for doing what I am doing,” but “evidence-based” sounds so much more sophisticated. And it is short code that can be slipped easily into conversations, and it is understood that it is a bit impolite, except in academic settings, to ask for a detailed explanation of the research evidence.

For many of the same reasons, I am not a fan of “ethical dilemmas.” I hear the term most often when someone wants to signal that he or she is wrestling with important and complex decisions. It is a way of indicating that the speaker is serious about ethics.

A “lemma” is a standard proof that can be inserted in a logical argument without having to go through all the detailed steps. It is a prepackaged thought sequence that removes the need for actually working things out. A “dilemma” is a situation where one lemma justifies one conclusion while another justifies a different course of action.

Ethical dentistry rarely involves dilemmas. Overtreatment, upcoding, biased informed consent and shoddy work are not dilemmas. Most often, ethical issues turn on whether one has the courage to do what is clearly needed.

Often dilemma talk is about finding a justification for a tricky situation with a possible but shaky option. A dentist may choose to focus his or her practice on high-end patients who need primarily elective and nonhealth enhancements based on the principle of respect for autonomy. Letting people choose what they want (dentist and patient) is one of the five ethical principles promoted by the ADA. The principle justifies the practice.

One might object that there are other principles that are being overlooked. Beneficence (promoting the good of others) and justice (the fair distribution of benefits and burdens) come to mind. Now we have a trilemma. But we do not have a solution. How can we decide which justification takes precedence? The ethics experts say we should make an informed decision based on a “balance of the principles.” This means that there is a superprinciple that lets us decide what the right balance is. No one knows what that superprinciple is, but we have seen people use it. ■



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3-D printed tooth. (Image courtesy of Herrmann, Ren et al./ University of Groningen)

## 3-D Printed Objects That Can Kill Bacteria

Recently published in the journal *Advanced Functional Materials*, material scientists and orthodontists have reported that 3-D printed teeth made with antimicrobial composite resins can kill bacteria on contact.

For this study, researchers took monomers that are routinely used in dentistry, and set out to add what are known as quaternary ammonium ions. These positively charged molecules interact with the negatively charged bacterial membrane and puncture a hole in it, killing the microbes. The scientists used two approaches to make a printable antimicrobial material.

In the first, they mixed two different monomers and an additional quaternary ammonium compound with a polymerizable unit and used UV light to polymerize the whole mixture. But some antimicrobials could still leach out of the polymer mesh.

In the second approach, they first polymerized the antimicrobial groups to form long chains. The resulting antimicrobial polymer was added to the 3-D printing fluid and became entangled with the other polymers during polymerization. Here only very little antimicrobial material diffused out.

“The trick in both approaches was to get the mixture right to enable 3-D printing and minimize any leakage of the antimicrobials. You don’t want them to enter the mouth and thus the intestines,

## 70 Percent of Dentists Experience Low-Back Pain

In a recent study, researchers reported on the prevalence, symptoms of and risk factors for low-back pain among dentists as well as the possible correlation of these factors with working posture and how to reduce prevalence. According to the authors, 70 percent of the dentists evaluated reported back pain, with low-back pain predominating in 47.6 percent of cases.

The study, published in the *Journal of Physical Therapy Science*, included 60 dentists (32 females and 28 males) who completed an anonymous questionnaire that focused on low-back pain. Results showed that of the subjects, 90.5 had a mild-to-moderate level of pain severity, and only 9.5 percent had a severe level of low-back pain.

More than half (57 percent) of the dentists were treating between one and three patients a day, demonstrating that “the number of patients treated and number of hours worked per day did not correlate with the incidence of back pain,” the authors wrote. Additionally, even though 63 percent of dentists reported being aware of the advantages of assistive tools, only 40 percent said they used them. By promoting awareness of the value of using available assistive devices, the rate of musculoskeletal disorders could be reduced, the authors noted.

The study also found that among dental professionals, the symptoms of low-back pain increased with the number of years in practice. The authors concluded that work postures need to be improved and “the practice of relaxation and stretching exercises during breaks in the dentists’ work schedules is mandatory.”

For more, see the full report in the *Journal of Physical Therapy Science*, 27: 2803-2806, 2015.

where they could kill off gut microbes,” said Andreas Herrmann in a news release.

Dr. Herrmann explained how the use of antimicrobials could solve a major problem in dentistry. “Any artificial objects in the mouth can be colonized by bacteria,” he said. “All implants in medicine suffer from biofilm formation, so giving them antibacterial properties would be beneficial.”

For more information, see the study in the journal *Advanced Functional Materials*, vol. 25, issue 43, pp. 6756–6767, Nov. 18, 2015.



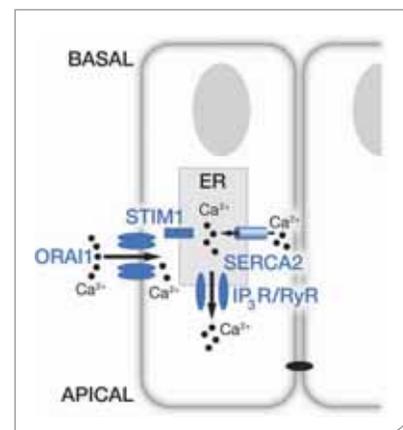
## Cellular Mechanism Calcium Transport in Dental Enamel Cells Formation

Recent research led by the NYU School of Dentistry reports the results of a study showing for the first time the cellular mechanism for transporting calcium in the formation of dental enamel cells.

The authors of the study, published in the journal *Scientific Reports*, found that the main calcium influx pathway involved in the mineralization of enamel called the CRAC (Ca<sup>2+</sup> release-activated Ca<sup>2+</sup>) channel — the main type of SOCE (Store-operated Ca<sup>2+</sup> entry) channel —

is critical for controlling calcium uptake, which is necessary for the development of tooth enamel. Despite calcium's central role in the development of enamel, it was not previously understood how it was transported from the bloodstream to the zone where enamel crystals grow.

“One of the main characteristics of enamel is its durability, which it owes to the particularly high amount of calcium it contains as well as other minerals,” said lead researcher Rodrigo Lacruz, MSc,



Schematic model representing calcium entry in enamel cells. (Image courtesy of Nurbaeva MK, et al. *Scientific Reports*, Oct. 30, 2015.)

PhD, in a news release. “But calcium has to reach the area where crystals are forming. If this action is impeded, which happens when there are mutations in the genes that form the core of the CRAC channel, enamel is severely affected.”

This study used freshly dissected enamel cells (ameloblasts) from rodent teeth to modulate physiological processes in order to understand the contribution of CRAC channels in enamel calcium signaling. The study builds on previous genome research that identified the genes involved in the maturation stage of enamel and other studies, which showed that mutations in the genes *ORAI1* and *STIM1*, the main components of the CRAC channel, can affect enamel development. The new study demonstrates a physiological mechanism for calcium influx in enamel cells and shows how it can be modulated.

“By turning off calcium pumps in the endoplasmic reticulum we were able to see the contribution of CRAC channels to calcium uptake and signaling, and more specifically to how they modulate enamel gene function,” Lacruz said.

According to Lacruz, this new frontier in enamel biology brings closer to reality the possibility of regenerating enamel which in the long run will benefit people who suffer from enamel-formation disorders.

For more, see the study in the journal *Scientific Reports*, 2015, 5, article number: 15803.

## Hookah Smoking and Head and Neck Conditions

According to the Centers for Disease Control and Prevention, 2.3 million Americans smoke tobacco from pipes, and many of those who smoke water pipes, or hookahs, believe it is less harmful than cigarettes. New research published in *The Journal of the American Dental Association* suggests hookah smoking is associated with serious oral conditions including gum diseases and cancer.

“We found that water pipe smoking is associated with serious health problems affecting the head and neck region,” said study author Teja Munshi, BDS, MPH, of Rutgers University, in a news release. “The public needs to know they are putting themselves at risk. They should be made aware of the dangers of smoking hookahs.”

The authors conducted a literature review that focused on water pipe smoking and head and neck conditions. They found water pipe smoking to be associated with gum diseases, dry socket, oral cancer and esophageal cancer among other conditions. According to the World Health Organization, smoking a hookah is the equivalent of smoking 100 cigarettes, based on the duration and number of puffs in a smoking session.

“This study sheds light on the common misconception that smoking from a water pipe is somehow safer than smoking a cigarette,” said JADA Editor Michael Glick, DMD. “Whether you are smoking a cigarette, an e-cigarette, a cigar or tobacco from a water pipe, smoking is dangerous not only to your oral health but to your overall health.”

For more details on the research results, see the study in *The Journal of the American Dental Association*, October 2015, Vol. 146:10, pp. 760-766.





## During Pregnancy, Nearly Half of Women Don't See Dentist

A recent national survey has discovered that 43 percent of women do not go for a dental checkup during pregnancy, even though 76 percent of those surveyed admitted to suffering from oral health problems while expecting, such as bleeding gums or toothaches.

Just over half, 55 percent, of women rate their oral health as very good or excellent during pregnancy, a drop from 63 percent pre-pregnancy, according to a news release. More than a third, 36 percent, of expectant mothers admitted that it has been more than a year since their last preventive dental visit, citing cost as the primary reason for skipping their dental checkups, even among those with dental benefits.

*Healthy Smiles for Mom and Baby: Insights Into Expecting and New Mothers' Oral Health Habits* is a national survey of 801 pregnant women and new mothers (within the past 12 months) between the ages of 21 to 45. Half have dental benefits. The survey found that 62 percent of those women brush their teeth at least twice a day, with that percentage increasing to 76 percent for those who have participated or who are participating in a dental benefit

## Glass Ionomer Cement Setting Is Non-Monotonic

Researchers recently revealed what they call "sweet points" for dental fillings, where bioactive glass ionomer cements used to fill cracks regain elasticity before hardening indefinitely, and according to authors of the new study, their findings could have implications for creating more durable and longer-lasting fillings in the future.

Published in the journal *Nature Communications*, the team of scientists used "nano-level dentistry" to measure how cement sets in real time. The authors looked at the surface between the hard glass particles and surrounding polymer as the strength of the cement develops and used computer models to guide them with intense beams of neutrons. They found that dental cement sets in fits and starts rather than hardening continuously.

"Our work opens up the possibility of tailoring the strength of non-mercury cements by honing in on the special setting points, which we call 'sweet points,' to make environmentally friendly dental fillings that not only last longer but could prevent further tooth decay," said co-author Gregory Chass, PhD, in a news release.

"Contrary to convention, we find setting is non-monotonic, characterized by abrupt features not previously detected, including a glass-polymer coupling point, an early setting point, where decreasing toughness unexpectedly recovers, followed by stress-induced weakening of interfaces. Subsequently, toughness declines asymptotically to long-term fracture test values," the authors wrote in a summary of their report.

"Dental fillings are really complex materials. Using neutrons we have discovered how mechanical toughness develops, element by element. This is fundamental physics in action for the general good," said co-author Neville Greaves, PhD.

For more, see the study in the journal *Nature Communications*, vol. 6, article number 8631.



Glass cement fillings. (Image courtesy of Semmelweis University Dental School)

plan maternity program. Additionally, 74 percent of women who are participating or have participated in a dental benefit plan maternity program rate their oral health as very good or excellent compared to just 55 percent of pregnant women overall.

The survey also found that compared to other expectant mothers, women whose medical doctors/obstetricians talked to them about their oral health

during pregnancy are almost twice as likely to have a dental checkup while pregnant (77 percent versus 41 percent).

For more, see the survey results at [newsroom.cigna.com/NewsReleases/Help-Keep-Mom-Smiling--Cigna-Study-Finds-Majority-of-Pregnant-Women-Suffer-Oral-Health-Problems--But-43--Don-t-Get-Dental-Checkups.htm](http://newsroom.cigna.com/NewsReleases/Help-Keep-Mom-Smiling--Cigna-Study-Finds-Majority-of-Pregnant-Women-Suffer-Oral-Health-Problems--But-43--Don-t-Get-Dental-Checkups.htm).

## Researchers Say Tooth Gel Will Regrow Enamel

Researchers at the Herman Ostrow School of Dentistry of USC recently proposed a promising method to regrow nonliving hard tissue, lessening or even eliminating pain associated with tooth decay.

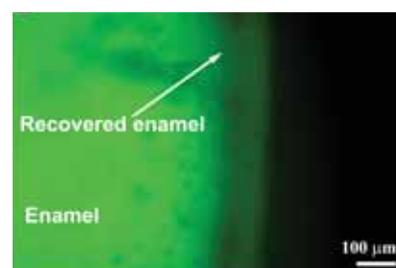
Published in the journal *Biomaterials*, the new study reports that matrix metalloproteinase-20 (MMP-20), an enzyme found only in teeth, “chops up amelogenin proteins,” which facilitate organized enamel crystal formation. MMP-20 clears the way for hard material to

usurp vacated space. The research team on this is the first to define the function of an enzyme for preventing protein occlusion inside a crystal, according to the study’s senior author Janet Moradian-Oldak, a dentistry professor at the Herman Ostrow School of Dentistry of USC, who has investigated methods to regrow tooth enamel for the past two decades.

In the recent study, the authors explain that they “used spectroscopy and electron microscopy techniques to qualitatively and quantitatively



Representative fluorescent images of cross-sections of enamel blocks after seven days of cycle I without (above) and with (below) CS-AMEL hydrogel treatment. (Source: Herman Ostrow School of Dentistry of USC)



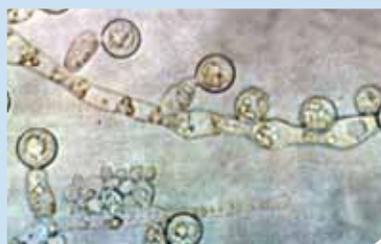
## Genotypic Distribution of *C. Albicans* Associated With Children’s Caries Experience

Researchers recently conducted a study that aimed to explore the genotypic diversity and cariogenicity of *Candida albicans* from children with early childhood caries and children who are caries free. The authors discovered that the genotypic distribution of *C. albicans* is associated with the caries experience of children, and the genotype may be related to its acidogenicity at pH 4.0, according to the report published in the journal *BMC Oral Health*.

For this study, the authors collected dental plaque samples from 238 children with early childhood caries and from 125 caries-free children for *C. albicans* isolation. The researchers then analyzed *C. albicans* genotypes, and the strains with different genotypes were tested with regard to acidogenicity and aciduricity.

Of 129 *C. albicans* isolates (105 children with early childhood caries and 24 caries-free children), 79 (61.2 percent) were found to belong to genotype A. Genotypes B and C were found more frequently in the early childhood caries group than in the caries-free group, indicating that the distribution of *C. albicans* genotypes differs among children with different caries experiences, the authors wrote. Additionally, the study found that the acid-forming abilities of *C. albicans* genotypes B and C were significantly higher than that of genotype A when cultured at pH 4.0.

For more information, see the full study in the journal *BMC Oral Health*, 2015, 15:144.



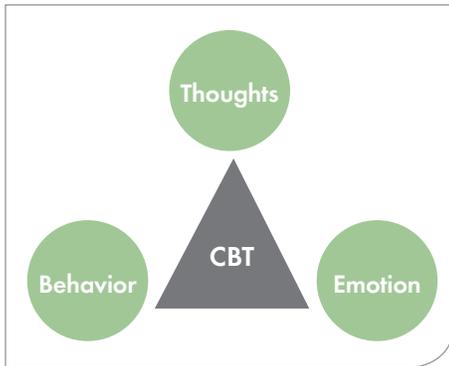
analyze occluded proteins within the isolated enamel crystals from MMP-20 null and Wild type (WT) mice.” The researchers’ results showed that the isolated enamel crystals of MMP-20 null mice had more organic macromolecules occluded inside them than enamel crystals from the WT mice.

“The crystal lattice arrangements of MMP-20 null enamel crystals were found to be significantly different from those of the WT,” the authors concluded.

“The findings regarding MMP-20 not only help us to further understand the mechanisms of enamel formation but also can be applied in the design of novel biomaterials for future clinical applications in dental restoration or repair,” said Dr. Moradian-Oldak. The next step is to alter the gel recipe using MMP-20 to create a stronger enamel-like seal, Dr. Moradian-Oldak said.

“We create a protective cover on enamel,” she said. “We restore the structure of enamel, and it will prevent decay from progressing.”

For more information, see the study published in the journal *Biomaterials*, January 2016; 75: 260-70.



## Cognitive Behavior Therapy Can Help Overcome Fear of the Dentist

A recent study, published in the *British Dental Journal*, examined the differences in oral health behavior and outcome between dentally phobic and nonphobic participants in the U.K. Adult Dental Health Survey (ADHS, 2009).

The study looked at the characteristics of 130 patients (99 women and 31 men) attending a psychologist-led cognitive behavioral therapy (CBT) service and the outcomes of their treatment.

According to the authors, the study found that more women than men reported dental phobia (16.8 percent and 7 percent, respectively). Based on the “Modified Dental Anxiety Scale,” fear of dental injections and the dental drill were found to be the most common high-scoring items.

The authors also reported that, generally, people with dental phobia were irregular attendees (58.5 percent), had a less restored dentition, increased numbers of one or more teeth with caries (39.9 percent), and were more likely to have a puss, ulceration, fistulae, abscess (PUFA) score of one or more (12.2 percent) in comparison to the nonphobic group (5.6 percent).

Individuals were referred to support services through the care of their general practitioners, and of all patients referred, 79 percent went on to receive dental treatment without the need for sedation while 6 percent had their dental treatment under sedation. The

## Oral Consequences of Methamphetamine Use

Researchers from the University of California, Los Angeles, School of Dentistry, the UCLA Fielding School of Public Health and the UCLA Integrated Substance Abuse Program recently published new findings that provide conclusive evidence of disproportionately high rates of dental disease in methamphetamine abusers. According to a news release from the university, this is the largest study of meth abusers to date, investigating the patterns and severity of dental disease through comprehensive oral examinations and psychosocial assessments in 571 methamphetamine abusers.

In the new study, researchers found that more than 96 percent of those studied experienced dental cavities and 58 percent had untreated tooth decay. Only 23 percent retained all of their natural teeth, compared to 48 percent for the general population in the U.S. The study also found that women methamphetamine abusers had higher rates of tooth loss and caries, as well as a greater prevalence of anterior caries.

When looking at the rate of periodontitis among methamphetamine abusers, the team of researchers found more than 89 percent showing total periodontitis and that those who were older, who were African American or who smoked cigarettes were more likely to suffer from severe periodontitis. Forty percent of those included in the study reported they were self-conscious or embarrassed about their dental appearance.

Methamphetamine abusers have high rates of dental and periodontal disease and manifest a dose-response relationship, with greater levels of methamphetamine use associated with higher rates of dental disease, the authors concluded. The high rates of dental disease and the concerns about dental appearance among methamphetamine abusers could be used by dentists as the basis for screening, brief behavioral interventions and referrals for treatment.

For more, see the study in *The Journal of the American Dental Association*, December 2015, vol. 146, issue 12, pp. 875–885.



average number of CBT appointments required before a patient received dental treatment without sedation was five.

“People with dental phobia are most commonly given sedation to allow them to become relaxed enough for a short period of time to have their dental treatment performed. However, this does not help them to overcome their fear in the long term,” said the study’s lead author professor Tim Newton, in a

news release. “The primary goal of our CBT service is to enable patients to receive dental treatment without the need for sedation, by working with each individual patient to set goals according to their priorities. Our study shows that after an average five CBT sessions, most people can go on to be treated by the dentist without the need to be sedated.”

For more, see the study published in the *British Dental Journal*, 219, E9 (2015).



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SPIKE

# UCSF Protocol for Caries Arrest Using Silver Diamine Fluoride: Rationale, Indications and Consent

Jeremy A. Horst, DDS, PhD; Hellene Ellenikiotis, DDS; and Peter L. Milgrom, DDS

**ABSTRACT** The Food and Drug Administration recently cleared silver diamine fluoride for reducing tooth sensitivity. Clinical trials document arrest and prevention of dental caries by silver diamine fluoride. This off-label use is now permissible and appropriate under U.S. law. A CDT code was approved for caries arresting medicaments for 2016 to facilitate documentation and billing. We present a systematic review, clinical indications, clinical protocol and consent procedure to guide application for caries arrest treatment.

## AUTHORS

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*Conflict of Interest*  
*Disclosure:* Dr. Horst is co-founder and CSO at OraViz.

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*Conflict of Interest*  
*Disclosure:* None reported.

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*Conflict of Interest*  
*Disclosure:* Dr. Milgrom is a principal in ADP Silver Dental Arrest LLC, which licenses permission to market Advantage Arrest to Elevate Oral Care LLC.

Until now, no option for the treatment of dental caries in the U.S. besides restorative dentistry has shown substantial efficacy.<sup>1</sup> Silver diamine fluoride is an inexpensive topical medicament used extensively in other countries to treat dental caries across the age spectrum. No other intervention approaches the ease of application and efficacy. Multiple randomized clinical trials — with hundreds of patients each — support its use for caries treatment, thus substantiating an intervention that addresses an unmet need in American dentistry. In August 2014, the Food and Drug Administration (FDA) cleared the first silver diamine fluoride product for market, and as of April 2015, that product is available.

Since its approval in Japan more than 80 years ago,<sup>2</sup> more than 2 million containers have been sold. The silver acts as an antimicrobial, the fluoride promotes remineralization and the ammonia stabilizes high concentrations in solution.<sup>3</sup>

Because silver diamine fluoride is new to American dentistry and dental education, there is a need for a standardized guideline, protocol and consent. The University of California, San Francisco, School of Dentistry paradigm shift committee assembled a subcommittee with the following goals:

- Use available evidence to develop a list of clinical indications.
- Define a protocol that maximized safety and efficacy and minimized inadvertent staining of clinical facilities.

- Build an informed consent document at the eighth-grade reading level.

We conducted a systematic review, inquired of authors of published clinical and in vitro studies about details and considerations in their protocols and consulted experts in cariology and materials chemistry where evidence was lacking. The work of this committee resulted in the adoption of silver diamine fluoride use in the UCSF student clinics.

### Methods

A literature review was designed by a medical librarian to search PubMed and the International Association of Dental Research abstract archive with the following search terms: “33040-28-7” OR “1Z00ZK3E66” OR “silver diamine fluoride” OR “silver fluoride” OR “silver diamine fluoride” OR “diammine silver fluoride” OR “ammonical silver fluoride” OR “ammoniacal silver fluoride”. Differences in nomenclature have led to confusion around this material. Another review was completed with the terms “dental” OR “caries” AND “silver nitrate” AND “clinical.”

### Material

Silver diamine fluoride (38% w/v  $\text{Ag}(\text{NH}_3)_2\text{F}$ , 30% w/w) is a colorless topical agent comprised of 24.4-28.8% (w/v) silver and 5.0-5.9% fluoride at pH 10,<sup>4</sup> and marketed as Advantage Arrest by Elevate Oral Care LLC (West Palm Beach, Fla.). Other companies may market silver diamine fluoride in the future following determination of substantial equivalence and FDA clearance.

### Mechanisms

Silver diamine fluoride is used for caries arrest and treatment of dentin hypersensitivity. In the treatment of exposed sensitive dentin surfaces,

topical application results in the development of a squamous layer on the exposed dentin, partially plugging the dentinal tubules.<sup>5</sup> High concentration aqueous silver has been long known to form this protective layer.<sup>6</sup> Decreased sensitivity in treated patients<sup>7,8</sup> is consistent with the hydrodynamic theory of dentin hypersensitivity.<sup>9</sup>

Dental caries is a complex progression involving dietary sugars, bacterial metabolism, demineralization and organic degradation. The collagenous organic matrix is

Silver diamine fluoride outperforms other anticaries medicaments in killing cariogenic bacteria in dentinal tubules.

exposed once a dentin surface is demineralized and destroyed by native and bacterial proteases to enable a lesion to enlarge.<sup>10</sup> Upon application of silver diamine fluoride to a decayed surface, the squamous layer of silver protein conjugates forms, increasing resistance to acid dissolution and enzymatic digestion.<sup>11</sup> Hydroxyapatite and fluorapatite form on the exposed organic matrix, along with the presence of silver chloride and metallic silver.<sup>5</sup> The treated lesion increases in mineral density and hardness while the lesion depth decreases.<sup>5</sup> Meanwhile, silver diamine fluoride specifically inhibits the proteins that break down the exposed dentin organic matrix: matrix metalloproteinases,<sup>11</sup> cathepsins<sup>12</sup> and bacterial collagenases.<sup>5</sup> Silver

ions act directly against bacteria in lesions by breaking membranes, denaturing proteins and inhibiting DNA replication.<sup>13,14</sup> Ionic silver deactivates nearly any macromolecule. Silver diamine fluoride outperforms other anticaries medicaments in killing cariogenic bacteria in dentinal tubules.<sup>15</sup>

Silver and fluoride ions penetrate ~25 microns into enamel<sup>16</sup> and 50-200 microns into dentin.<sup>17</sup> Fluoride promotes remineralization, and silver is available for antimicrobial action upon release by re-acidification.<sup>18</sup> Silver diamine fluoride arrested lesions are 150 microns thick.<sup>19</sup>

Artificial lesions treated with silver diamine fluoride are resistant to biofilm formation and further cavity formation, presumably due to remnant ionic silver.<sup>20,21</sup> More silver and fluoride is deposited in demineralized than nondemineralized dentin. Correspondingly, treated demineralized dentin is more resistant to caries bacteria than treated sound dentin.<sup>22</sup> When bacteria killed by silver ions are added to living bacteria, the silver is re-activated so that effectively the dead bacteria kill the living bacteria in a “zombie effect.”<sup>23</sup> This reservoir effect helps explain why silver deposited on bacteria and dentin proteins within a cavity has sustained antimicrobial effects.

### Clinical Evidence

#### *Silver Nitrate Plus Fluoride Varnish*

Before the FDA cleared silver diamine fluoride, some U.S. dentists sequentially applied silver nitrate then fluoride varnish to dentinal decay as the only available noninvasive option for caries treatment. Duffin rediscovered silver nitrate from the early literature,<sup>24</sup> which had been lost

to modern cariology. Surprisingly, there is no mention of silver nitrate in either of the American Dental Association Council on Scientific Affairs reports on *Nonfluoride Caries-Preventive Agents*<sup>25</sup> or *Managing Xerostomia and Salivary Gland Hypofunction*,<sup>26</sup> and it is not part of standard dental school curricula. Case series of carious lesions arrested by silver nitrate date to the 1800s. For example, in 1891, 87 of 142 treated lesions were arrested.<sup>27</sup> Percy Howe, DDS, then director of the Forsyth Institute in Boston, added ammonia to silver nitrate, making it more stable and effective as an antimicrobial for application to any infected tooth structure from early cavitated lesions to infected root canals.<sup>28</sup> Duffin added the application of fluoride varnish following silver nitrate, simulating silver diamine fluoride. While his clinic doubled in patients, cases needing general anesthesia disappeared. His review of randomly selected charts showed only seven of 578 treated lesions progressed within two and a half years to the point that extractions were needed.<sup>24</sup> Thus, with the exception of Duffin's and one other report, attention to silver nitrate largely disappeared by the 1950s. The lore is that use and teaching of this intervention were lost with the introduction of effective local anesthetic to enable painless restorations and fluoride for caries prevention. Because no high-quality clinical trials have been performed, we did not include the silver nitrate plus fluoride varnish regimen in our recommendation.

### Silver Diamine Fluoride

We found nine published randomized clinical trials evaluating silver diamine fluoride for caries arrest and/or prevention of at least one year in duration. These

studies each involved hundreds of children aged 3 to 9 or adults aged 60 to 89 (FIGURES 1 and 2). Most participants had low (< 0.3 ppm) fluoride in the environmental water and reported using fluoride toothpaste (e.g., 73 percent).<sup>29</sup> Silver diamine fluoride was applied with cotton isolation. Lesions were detected with mirror and explorer only. All studies were registered and met the Consolidated Standards of Reporting Trials requirements. Clinical cases and studies not meeting these criteria can be found elsewhere.<sup>30</sup>

When stannous fluoride was used to activate color change, a break in the black color within a lesion at six months was highly sensitive and specific for active caries.

Caries arrest increased dramatically after reapplication from one year posttreatment<sup>31-33</sup> to one and a half years,<sup>31,34</sup> and increasingly to two to three years (FIGURE 1).<sup>29,31,35</sup> Single application without repeat lost effect over time in the elderly.<sup>32</sup> Twice per year application resulted in more arrest than once per year.<sup>31,35</sup> Twelve percent silver diamine fluoride was markedly less effective.<sup>32</sup>

Darkening of the entire lesion indicated success at follow-up and is suggested to facilitate diagnosis of caries arrest status by nondentists. A longitudinal study reported that color activation of silver diamine fluoride with 10% stannous fluoride resulted in less first molar caries.<sup>36</sup> Tea extract was used in one group to activate color change for improved follow-up diagnosis; no differences

in arrest were seen.<sup>32</sup> Indeed, when stannous fluoride was used to activate color change, a break in the black color within a lesion at six months was highly sensitive and specific for active caries.<sup>37</sup>

Silver diamine fluoride greatly outperformed fluoride varnish for caries arrest<sup>29</sup> and was equivalent or better than glass ionomer cement (GIC) (FIGURE 1).<sup>31,33</sup> The addition of semiannual intensive oral health education with the application of silver diamine fluoride in the elderly increased the arrest of root caries (FIGURE 1).<sup>38</sup>

### Caries Prevention

When silver diamine fluoride was applied only to carious lesions, impressive prevention was seen for other tooth surfaces.<sup>29,35</sup> Fluoride-releasing GIC can have this effect but it is limited to surfaces adjacent to the treated surface and of short duration. Direct application to healthy surfaces in children also helps prevent caries (FIGURE 2).<sup>29,35,39</sup> Two studies show great difference in the level of prevention in the elderly;<sup>38,40</sup> the difference is hard to reconcile. As seen for arrest, prevention is less after one year without repeat application.<sup>41</sup>

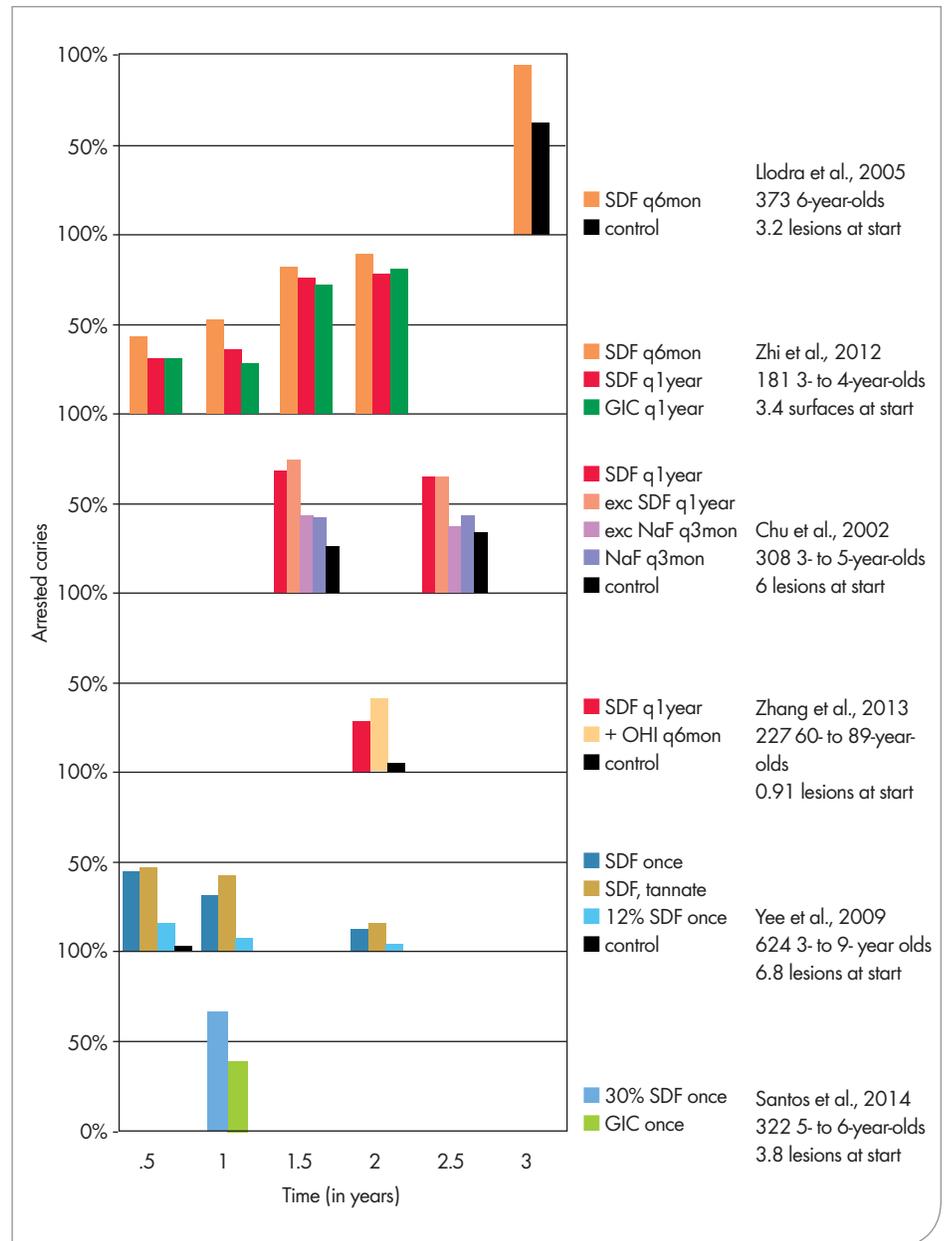
Annual application of silver diamine fluoride prevented many more carious lesions than four-times-per-year fluoride varnish in both children<sup>29</sup> and the elderly.<sup>40</sup> Prevention was roughly equivalent to twice-per-year varnish in one study (FIGURE 2).<sup>39</sup> The addition of semiannual intensive oral health education in a study of the elderly increased prevention.<sup>38</sup> Although many fell out, GIC or resin sealants outperformed silver diamine fluoride in preventing caries in the first molars of children,<sup>39,41</sup> though the cost was ~20 times more.

### Ongoing Trials

Unpublished reports of clinical studies unanimously confirm better caries arrest and/or prevention by silver diamine fluoride over control or other materials. A one-year report of a study of the elderly demonstrated that the addition of a saturated solution of potassium iodide (SSKI) to decrease discoloration did not significantly alter caries arrest or prevention.<sup>42</sup> This was confirmed in the two-year examinations (personal communication, Edward Lo). A one-year report of a study in children showed that the application once per week for three consecutive weeks, once per year, was more effective than that of single annual application.<sup>43</sup> Other studies have recently begun to evaluate the ability of silver diamine fluoride to arrest interproximal carious lesions, to compare the relative efficacy of silver diamine fluoride to the combination of silver nitrate plus fluoride varnish and to compare the effects on populations with or without access to fluoridated water. Final reports from these studies will follow in the coming years.

### Recommendations From the Literature on Clinical Efficacy

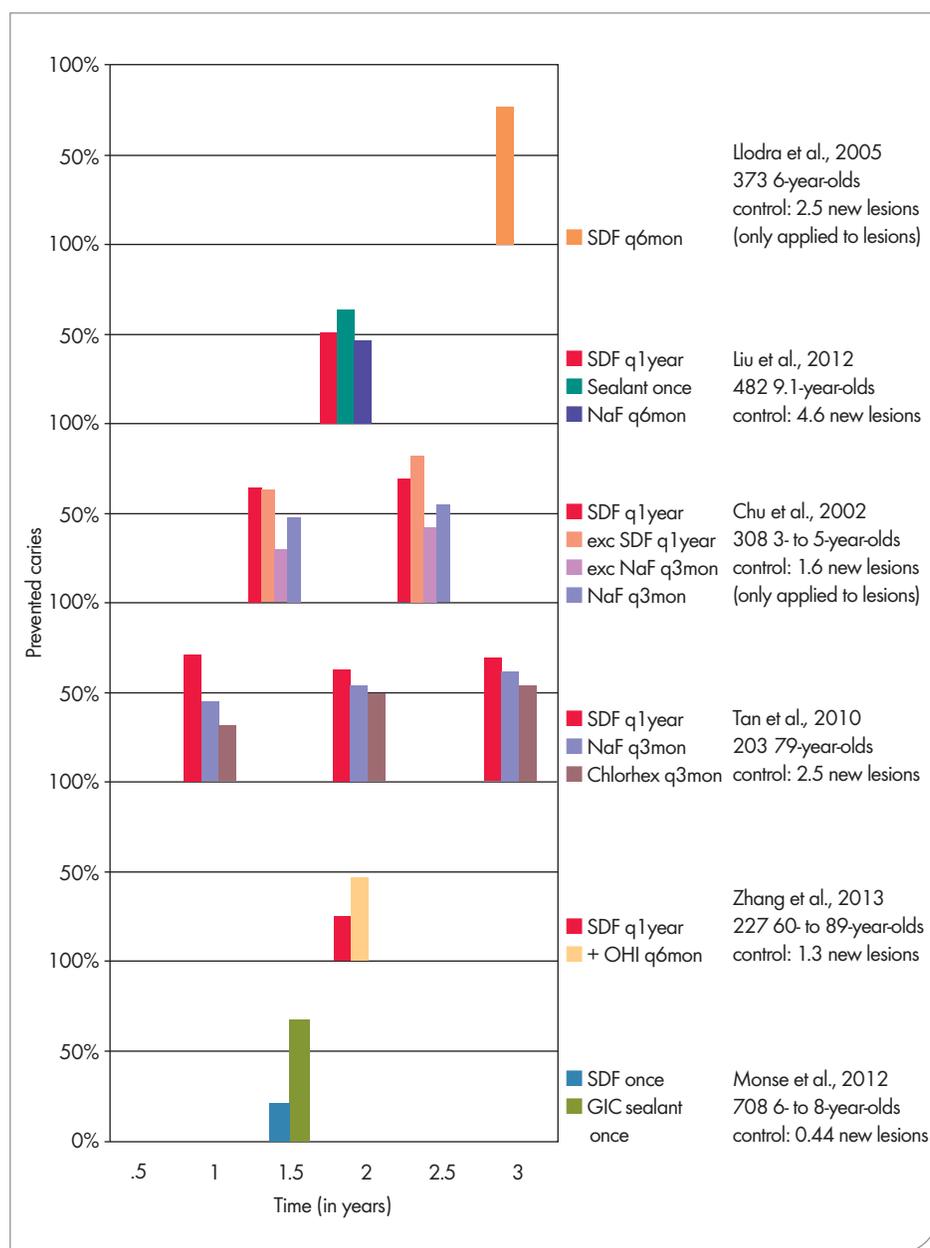
These studies show that 38% silver diamine fluoride is effective and efficient in arresting and preventing carious lesions. Application only to lesions appears to be similarly effective in preventing cavities in other teeth and surfaces as applying directly. Single application appears insufficient for sustained effects, while annual re-application results in remarkable success, and even greater effects with semi-annual application. From these data, we recommend twice-per-year application, only to carious lesions without excavation, for at least the first two years.



**FIGURE 1.** Graphic summary of randomized controlled trials demonstrating caries arrest after topical treatment with 38% silver diamine fluoride (SDF). Studies are arranged vertically by frequency of silver diamine fluoride application. Caries arrest is defined as the fraction of initially active carious lesions that became inactive and firm to a dental explorer. SDF (38% unless noted otherwise); q6mon, every six months; q1year, every year; q3mon, every three months; GIC, glass ionomer cement; NaF, 5% sodium fluoride varnish; + OHI q6mon, SDF every year and oral hygiene instructions every six months.

For any patient with active caries, we recommend considering replacement of fluoride varnish as the primary means to prevent new lesions, with application of silver diamine fluoride to the active lesions only. For patients without access

to both sealants and monitoring, silver diamine fluoride is the agent of choice for prevention of caries in permanent molars — particularly as there is no margin to leak and thereby facilitate deep caries and it does not stain sound enamel.



**FIGURE 2.** Graphic summary of randomized controlled trials demonstrating caries prevention after topical treatment of carious lesions with 38% silver diamine fluoride. Prevented caries is defined as the fraction of new carious lesions in treatment groups as compared to those in the placebo or no treatment control group. Chlorhex, 1% chlorhexidine varnish.

Longer studies are needed to determine whether caries arrest and prevention can be maintained with decreased application after two to three years, and whether more frequent use would enhance efficacy. Traditional or

nontraditional restorative approaches, such as the atraumatic restorative technique (ART)<sup>44</sup> and Hall crowns,<sup>45</sup> should be performed as dictated by the response of the patient, disease progression and the nature of individual lesions.

## Safety

### Maximum Dose and Safety Margin

The margin of safety for dosing is of paramount concern. In gaining clearance from the FDA, female and male rat and mouse studies were conducted to determine the lethal dose (LD50) of silver diamine fluoride by oral and subcutaneous administration. Average LD50 by oral administration was 520 mg/kg and by subcutaneous administration was 380 mg/kg. The subcutaneous route is taken here as a worst-case scenario. One drop (25  $\mu$ L) is ample material to treat five teeth and contains 9.5 mg silver diamine fluoride. Assuming the smallest child with caries would be in the range of 10 kg, the dose would be 0.95 mg/kg child. Thus, the relative safety margin of using an entire drop on a 10 kg child is 380 mg/kg LD50/0.95 mg/kg dose = four-hundredfold safety margin. The actual dose is likely to be much smaller, for example 2.37 mg total for three teeth was the largest dose measured in six patients.<sup>46</sup> The most frequent application monitored in a clinical trial was weekly for three weeks, annually.<sup>43</sup> Thus, we set our recommended limit as one drop (25  $\mu$ L) per 10 kg per treatment visit, with weekly intervals at most. This dose is commensurate with the Environmental Protection Agency's (EPA) allowable short-term exposure of 1.142 mg silver per liter of drinking water for one to 10 days (Agency for Toxic Substances and Disease Registry, ATSDR, 1990).

Cumulative exposure from lower-level acute or chronic silver intake has no real physiologic disease importance, but the bluing of skin in argyria should obviously be avoided. The EPA set the lifetime exposure conservatively at 1 gm to safely avoid argyria. The highest applied dose for three teeth measured in the pharmacokinetic study, 2.37 mg, would enable > 400 applications.<sup>46</sup> Silver

nitrate (typically a 25% solution) has been used for more than 100 years in the U.S. without incident, including acceptance by the ADA, and in other countries for arresting dental caries.<sup>3</sup>

### Adverse Effects

Not a single adverse event has been reported to the Japanese authorities since they approved silver diamine fluoride (Saforide, Toyo Seiyaku Kasei Co. Ltd., Osaka, Japan) more than 80 years ago.<sup>47</sup> The manufacturer estimates that more than 2 million multi-use containers have been sold, including > 41,000 units in each of the last three reporting years.

In the nine randomized clinical trials in which silver diamine fluoride was applied to multiple teeth to arrest or prevent dental caries, the only side effect noted was for three of 1,493 children or elderly patients monitored for one to three years who experienced “a small, mildly painful white lesion in the mucosa, which disappeared at 48 [hours] without treatment.”<sup>29,31-33,35,38,40,41,48</sup> The occurrence of reversible localized changes to the oral mucosa was predicted in the first reports of longitudinal studies.<sup>49</sup> No adverse pulpal response was observed.

Gingival responses have been minimal. In a pharmacokinetic study of silver diamine fluoride application to three teeth in each of six 48- to 82-year-olds, no erythema, bleeding, white changes, ulceration or pigmentation was found after 24 hours. Serum fluoride hardly went up from baseline, while serum silver increased about tenfold and stayed high past the four hours of measurement.<sup>46</sup> In a two-site hypersensitivity trial of 126 patients in Peru, at baseline 9 percent of patients presented redness scores of 2 (1 being normal, 2 being mild to moderate redness and 3 being severe); and after one day, 13 percent in silver diamine fluoride treated patients versus 4 percent

in controls. All redness was gone at seven days. Meanwhile, gingival index improved slightly in silver diamine fluoride treated patients.<sup>7</sup> Nonetheless, gingival contact should be minimized. In our experience, it has been adequate to coat the nearby gingiva with petroleum jelly, use the smallest available microsponge and dab the side of the dappen dish to remove excess liquid before application.

Concerns for fluoride safety are most relevant to chronic exposure,<sup>50</sup> whereas this is an acute exposure. Chronically high systemic fluoride results in dental

At least for children, many parents have seen the color changes as a positive indication that the treatment was effective.

fluorosis. The ubiquitous use of fluoride-based gas in general anesthetics has shown that the first acute response is transient renal holding, and is rare.<sup>51</sup> Concerns have been raised about poorly controlled silver diamine fluoride concentrations<sup>52</sup> and fluorosis appearing in treated rats.<sup>53</sup> However, silver and fluoride levels are closely monitored for the U.S. product, and the Health Department of Western Australia conducted a study that found no evidence of fluorosis resulting from long-term proper use of silver diamine fluoride.<sup>54</sup> Therefore, we have concluded that the development of fluorosis after application of the U.S.-approved product is not a clinically significant risk.

Silver allergy is a contraindication. Relative contraindications include any significant desquamative gingivitis or

mucositis that disrupts the protective barrier formed by stratified squamous epithelium. Increased absorption and pain would be expected with contact. Heightened caution and use of a protective gingival coating may suffice.

A saturated solution of potassium iodide (SSKI) is contraindicated in pregnant women and during the first six months of breastfeeding because of the concern of overloading the developing thyroid with iodide; thyroid specialists suggested a pregnancy test prior to use in women of childbearing age uncertain of their status.

### Nonmedical Side Effects

Silver diamine fluoride darkens carious lesions. At least for children, many parents have seen the color changes as a positive indication that the treatment was effective.<sup>29</sup> Application of an SSKI immediately following silver diamine fluoride treatment is thought to decrease staining (patent US6461161). This is an off-label use; potassium iodide is approved as an over-the-counter drug to facilitate mucus release to breathe more easily with chronic lung problems and to protect the thyroid from radioactive iodine in radiation emergencies. In our clinical experience, SSKI helps but does not dramatically effect stain; arrested lesions normally darken. Most stain remains at the dentin-enamel or cementum-enamel junction. However, SSKI maintains resistance to biofilm formation or activity in laboratory studies.<sup>20</sup> Also, SSKI maintained caries arrest efficacy in the early results of an ongoing clinical trial.<sup>42</sup> Meanwhile, silver diamine fluoride-treated lesions can also be covered with GIC or composite (see below for discussion on bonding).

Patients note a transient metallic or bitter taste. In our experience, with judicious use, the taste and texture

response is more favorable than the response to fluoride varnish.

Even a small amount of silver diamine fluoride can cause a “temporary tattoo” to the skin (on the patient or provider), like a silver nitrate stain or henna tattoo, and does no harm. Stain on the skin resolves with the natural exfoliation of skin in two to 14 days. Universal precautions prevent most exposures. Long-term mucosal stain, local argyria akin to an amalgam tattoo, has been observed when applying silver nitrate to intraoral wounds; we anticipate similar stains with submucosal exposure to silver diamine fluoride.

Silver diamine fluoride stains clinic surfaces and clothes. The stain does not come out once it sets. Spills should be cleaned up immediately with copious water, ethanol or bleach. High pH solvents such as ammonia may be more successful. Secondary containers and plastic liners for surfaces are adequate preventives.

### Effects on Bonding

Using a contemporary bonding system, silver diamine fluoride had no effect on composite bonding to noncarious dentin using either self-etch or full-etch systems.<sup>55</sup> In one study, simply rinsing after silver diamine fluoride application avoided a 50 percent decrease in bond strength for GIC.<sup>56</sup> In another study, increased dentin bond strength to GIC was observed.<sup>57</sup> Silver diamine fluoride decreased dentin bonding strength of resin-based crown cement by approximately one-third.<sup>58</sup> Thus, rinsing will suffice for direct restorations, while excavation of the silver diamine fluoride-treated superficial dentin is appropriate for cementing crowns.

### Indications

Countless patients would benefit from conservative treatment of nonsymptomatic active carious lesions. We discuss the following indications.

First, extreme caries risk is defined as patients with salivary dysfunction, usually secondary to cancer treatment, Sjogren’s syndrome, polypharmacy, aging or methamphetamine abuse. For these patients, frequent prevention visits and traditional restorations fail to stop disease progression. Similar disease recurrence occurs in severe early childhood caries.

Second, some patients cannot tolerate standard treatment for medical or psychological reasons. These include the preoperative child, the frail elderly, those with severe cognitive or physical

Countless patients would benefit from conservative treatment of nonsymptomatic active carious lesions.

disabilities and those with dental phobias. Various forms of immunocompromise mean that these same patients have a much higher risk of systemic infection arising from untreated dental caries. Many only receive restorative care with general anesthesia or sedation and others are not good candidates for general anesthesia due to frailty or another medical complexity. The Centers for Disease Control and Prevention (CDC) estimates 1.4 million people in the U.S. live in nursing homes and 1.2 million live in hospice.<sup>59</sup> These individuals tend to have medical, behavioral, physical and financial limitations that beg a reasonable option.

Third, some patients have more lesions than can be treated in one visit, such that new lesions arise or existing lesions become symptomatic while

awaiting completion of treatment. This is particularly relevant to the dental school setting where treatment is slow. American dentistry has been desperately lacking an efficient instrument to be used at the diagnostic visit to provide a step toward controlling the disease.

Fourth, some lesions are just difficult to treat. Recurrent caries at a crown margin, root caries in a furcation or the occlusal of a partially erupted wisdom tooth pose a challenge to access, isolation and cleansability necessary for restorative success.

Following the above considerations, we developed four indications for treatment of dental caries with silver diamine fluoride:

1. Extreme caries risk (xerostomia or severe early childhood caries).
2. Treatment challenged by behavioral or medical management.
3. Patients with carious lesions that may not all be treated in one visit.
4. Difficult to treat dental carious lesions.

Finally, these indications are for our school clinics. They do not address access to care. The U.S. Department of Health and Human Services estimates 108 million Americans are without dental insurance, and there are 4,230 shortage areas with 49 million people without access to a dental health professional.<sup>60</sup> Unlike fillings, failure of silver diamine fluoride treatment does not appear to create an environment that promotes caries, and thus needs to be monitored. Thus, a final important indication is:

5. Patients without access to dental care.

### Clinical Application

We considered practical strategies to maximize safety and effectiveness in the design of a clinical protocol for the UCSF dental clinics (**FIGURE 3**).

The key factor is repeat application

## Silver Diamine Fluoride (SDF) UCSF Protocol for Arresting Dental Carious Lesions or Treating Tooth Sensitivity

**Material:** Advantage Silver Arrest (38% SDF, purified water) from Elevate Oral Care.  
Shelf life: three years unopened. Do not refrigerate. Avoid freezing or extreme heat.

### Indications:

1. Extreme caries risk (xerostomia or severe early childhood caries).
2. Treatment challenged by behavioral or medical management.
3. Patients with carious lesions that may not all be treated in one visit.
4. Difficult to treat dental carious lesions.
5. Patients without access to dental care.

**Maximum dose:** 25  $\mu$ L (1 drop) / 10kg per treatment visit.

**SDF Contraindication:** Silver allergy.

**SDF Relative Contraindications:** Ulcerative gingivitis, stomatitis.

**SSKI Contraindications:** Pregnancy, breastfeeding.

### Considerations:

- Decayed dentin will darken as the caries lesions arrest. Most will be dark brown or black.
- SDF can stain the skin, which will clear in two to three weeks without treatment.
- SDF can permanently stain operatory surfaces and clothes.
- A control restoration (e.g., GI via ART or other material) may be considered after SDF treatment.
- Saturated solution of potassium iodide (SSKI, Lugol's Solution, various sources) can be used after SDF to decrease color changes.
- Re-application is usually recommended, biannually until the cavity is restored or arrested or the tooth exfoliates.

### Procedure:

1. Plastic-lined cover for counter, plastic-lined bib for patient.
2. Standard personal protective equipment (PPE) for provider and patient.
3. One drop of SDF into the deep end of a plastic dappen dish (also obtain one drop of SSKI in a separate dappen dish if selected).
4. Remove bulk saliva with saliva ejector.
5. Isolate tongue and cheek from affected teeth with 2-inch by 2-inch gauze or cotton rolls.
6. If near the gingiva, consider applying petroleum jelly with a cotton applicator for safety.
7. Dry affected tooth surfaces with triple syringe or if not feasible dry with cotton.
8. Bend microsponge, immerse into SDF, remove excess on side of dappen dish.
9. Apply directly onto the affected tooth surface(s) with microsponge.
10. Allow SDF to absorb for up to one minute if reasonable, then remove excess with gauze or cotton roll.  
(If using SSKI, apply with a different microsponge. Repeat one to three times until no further white precipitates are observed.  
Wait five to 10 seconds between applications. Remove excess with cotton.)
11. Rinse with water.
12. Place gloves, cotton and microbrushes into plastic waste bags.

**FIGURE 3.** Clinical protocol for the UCSF dental clinics.

over multiple years. We believe that dryness of the lesion during application is also important. Isolation with gauze and/or cotton rolls is sufficient, while air drying prior to application is thought to improve effectiveness. Allowing one to three minutes for the silver diamine fluoride to soak into and react with a lesion is thought to effect success.

Allowing only a few seconds to soak in due to the cooperation limits of very young patients commonly results in arrest. Application time in clinical studies does not correlate to outcome. However, our committee decided to be cautious in our recommendations for initial use. Longer absorption time also decreases concerns about removing silver

diamine fluoride with a posttreatment rinse. Removing any excess material with the same cotton used to isolate is routine to minimize systemic absorption.

Many clinicians place silver diamine fluoride at the diagnostic visit, then at one and/or three-month follow ups, then at semiannual recall visits (six, 12, 18, 24 months). Whether application needs

to continue after two or three years to maintain caries arrest is not known. Another approach is simply to substitute silver diamine fluoride for any application of fluoride varnish to a patient with untreated carious lesions. Increased frequency with higher disease burden follows the caries management by risk assessment (CAMBRA) principles.<sup>61</sup> It is relevant to take photographs to track lesions over time.

Efforts to improve the penetration of silver diamine fluoride into affected dentin by chemical cavity preparation have not been studied but are being explored clinically. Pretreatment with ethylenediaminetetraacetic acid (EDTA) to remove superficial hydroxyapatite in affected dentin may open the dentinal tubules to further silver diamine fluoride penetration. Pretreatment with hypochlorite (bleach) may help breakdown bacteria and exposed dentin proteins, but this may be redundant to the action of the silver. Hypochlorite to decrease discoloration after silver diamine fluoride treatment is not recommended, as the color comes from silver that cannot be broken down like organic chromophores and might break down dentin proteins stabilized against the effects of bacteria and acid by interactions with silver.

Experience with the combination of silver nitrate plus fluoride varnish (see above) has many practitioners asking about a topical varnish after silver diamine fluoride placement to prevent silver diamine fluoride taste and keep the silver diamine fluoride in the lesion. We see no evidence that varnish would help achieve either goal. Varnish does not seal. Rather, allowing more time for residence and diffusion of silver diamine fluoride to react with and dry into the lesion is more likely to improve effectiveness. Also, in our experience, silver diamine fluoride results in less aversive taste and texture responses than to fluoride varnish.

Decreased darkening of lesions in the esthetic zone improves acceptance. SSKI is an option if the patient is not pregnant, though significant darkening should still be expected. SSKI and silver diamine fluoride are not to be combined prior to application — SSKI can be placed after drying the silver diamine fluoride-treated tooth. Silver diamine fluoride does not prevent restoration of a lesion, thus it does not prevent esthetic options. While silver diamine fluoride has been shown to be more effective than ART or interim restorative treatment

In our experience, silver diamine fluoride results in less aversive taste and texture responses than to fluoride varnish.

(IRT),<sup>33</sup> the two are compatible and can be combined across one or more visits.

The California Business and Professions Code permits dental hygienists and assistants to apply silver diamine fluoride for the control of caries because they are topical fluorides (Section 1910.(b)). Physicians, nurses and their assistants are permitted to apply fluorides in California and in many other states and federal programs. The recent decision of the Oregon Dental Board to allow dental hygienists and assistants to place silver diamine fluoride under existing rules for topical fluoride medicaments sets a precedent. Dental hygienists and assistants in Oregon were barred from providing silver nitrate in a previous decision. All providers need to be trained. Applications should be tracked if applied to the same patient by multiple clinics.

### *Documentation and Billing*

A new code, D1354, for “interim caries arresting medication application” was approved by the Code on Dental Procedures and Nomenclature (CDT) Code Maintenance Commission for 2016. The code definition is “Conservative treatment of an active, nonsymptomatic carious lesion by topical application of a caries arresting or inhibiting medicament and without mechanical removal of sound tooth structure.” The CDT Code is the U.S. HIPAA standard code set and is required for billing. The Commission includes representatives from the major insurers, Medicaid, ADA, AGD and specialty organizations. Insurers are in the process of evaluating coverage for this treatment.

### *Legal Considerations*

Silver diamine fluoride is cleared by the FDA for marketing as a Class II medical device to treat tooth sensitivity. We are discussing off-label use as a drug to treat and prevent dental caries. This is a parallel situation to fluoride varnish, which has the same device clearance but is ubiquitously used off label by dentists and physicians as a drug to prevent caries. The same public health dentists who achieved the FDA device clearance are now applying for a dental caries indication. However, this is a more complicated process, normally only carried out by large pharmaceutical companies, and is likely to take longer.

### *Consent*

Because silver diamine fluoride is new in the U.S., it is important to communicate effectively. In the UCSF clinics, we are using a special consent form (**FIGURE 4**) as a way to inform patients, parents and caregivers, and

## UCSF Dental Center Informed Consent for Silver Diamine Fluoride

### Facts for consideration:

- Silver diamine fluoride (SDF) is an antibiotic liquid. We use SDF on cavities to help stop tooth decay. We also use it to treat tooth sensitivity. SDF application every six to 12 months is necessary.
- The procedure: 1. Dry the affected area. 2. Place a small amount of SDF on the affected area. 3. Allow SDF to dry for one minute. 4. Rinse.
- **Treatment with SDF does not eliminate the need for dental fillings or crowns to repair function or esthetics. Additional procedures will incur a separate fee.**
- I should not be treated with SDF if: 1. I am allergic to silver. 2. There are painful sores or raw areas on my gums (i.e., ulcerative gingivitis) or anywhere in my mouth (i.e., stomatitis).

### Benefits of receiving SDF:

- SDF can help stop tooth decay.
- SDF can help relieve sensitivity.



### Risks related to SDF include, but are not limited to:

- **The affected area will stain black permanently.** Healthy tooth structure will not stain. Stained tooth structure can be replaced with a filling or a crown.
- Tooth-colored fillings and crowns may discolor if SDF is applied to them. Color changes on the surface can normally be polished off. The edge between a tooth and filling may keep the color.
- If accidentally applied to the skin or gums, a brown or white stain may appear that causes no harm, cannot be washed off and will disappear in one to three weeks.
- You may notice a metallic taste. This will go away rapidly.
- If tooth decay is not arrested, the decay will progress. In that case the tooth will require further treatment, such as repeat SDF, a filling or crown, root canal treatment or extraction.
- These side effects may not include all of the possible situations reported by the manufacturer. If you notice other effects, please contact your dental provider.
- Every reasonable effort will be made to ensure the success of SDF treatment. There is a risk that the procedure will not stop the decay and no guarantee of success is granted or implied.

### Alternatives to SDF, not limited to the following:

- No treatment, which may lead to continued deterioration of tooth structures and cosmetic appearance. Symptoms may increase in severity.
- Depending on the location and extent of the tooth decay, other treatment may include placement of fluoride varnish, a filling or crown, extraction or referral for advanced treatment modalities.

### I CERTIFY THAT I HAVE READ AND FULLY UNDERSTAND THIS DOCUMENT AND ALL MY QUESTIONS WERE ANSWERED:

\_\_\_\_\_ (signature of patient) \_\_\_\_\_ (date)  
 \_\_\_\_\_ (signature of witness) \_\_\_\_\_ (date)

FIGURE 4. UCSF special consent form.

to standardize procedures because we have so many inexperienced student clinicians. All practices have established procedures for consent and an extra form may not be needed in the community. The normal elements of informed consent

apply. We sought to ensure awareness of the expected change in color of the dentin as the decay arrests, likelihood of reapplication and contraindications in the presence of silver allergy and stomatitis. Note the importance of distinguishing

between allergy to nickel and other trace metals rather than silver allergy, which is rare. We used readability measurements to guide intelligibility and included a progressively discoloring lesion to show stain of a lesion but not healthy enamel.

## Conclusion

Silver diamine fluoride is a safe, effective treatment for dental caries across the age spectrum. At UCSF, it is indicated for patients with extreme caries risk, those who cannot tolerate conventional care, patients who must be stabilized so they can be restored over time, patients who are medically compromised or too frail to be treated conventionally and those in disparity populations with little access to care.

Application twice per year outperforms all minimally invasive options including the atraumatic restorative technique — with which it is compatible but 20 times less expensive. It approaches the success of dental fillings after two or more years, and again, prevents future caries — while fillings do not. Silver diamine fluoride is more effective as a primary preventive than any other available material, with the exception of dental sealants, which are > 10 times more expensive and need to be monitored.

Saliva may play a role in caries arrest by silver diamine fluoride. Lower rates of arrest are seen in geriatric patients.<sup>38</sup> The elderly tend to have less abundant and less functional saliva, which generally explains their higher caries rate. In pediatric patients, higher rates of arrest are noted for buccal or lingual smooth surfaces and anterior teeth.<sup>31</sup> These surfaces bathe more directly in saliva than others. It is surprising that silver chloride is the main precipitant in treated dentin, as chloride is not a common component of dentin or silver diamine fluoride, so may come from the saliva.

Traditional approaches often provide only temporary benefit, given the highest rates of recurrent caries are in patients with the worst disease burden. The advent of a treatment for nonsymptomatic caries not requiring general anesthesia or sedation addresses long-standing

concerns about the expense, danger and practical complexity of these services.

Experience suggests that dryness prior to application enhances effectiveness. Good patient management is still profoundly relevant to the very young and otherwise challenged patients, though this one-minute intervention is more tolerable than other options. Silver diamine fluoride can readily replace fluoride varnish for the prevention of caries in patients who have active caries. This as a powerful new tool in the fight against dental caries, particularly suited for those who suffer most from this disease.

Clinical evidence supports continued application one to two times per year until the tooth is restored or exfoliates, and otherwise perhaps indefinitely. Some treated lesions keep growing, particularly those in the inner third of the dentin. It is unclear what will happen if treatment is stopped after two to three years and research is needed. ■

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## Periodontics and Oral-Systemic Relationships: Diabetes

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**ABSTRACT** The oral cavity is a part of the body. The health of the oral cavity affects the health of the entire body. This relationship is reciprocal, as the overall health of an individual will also affect the health of that individual's oral cavity. Periodontal disease is a common, chronic inflammatory disease affecting the supporting structures of the teeth. It has been proposed that periodontal disease is a risk factor for systemic diseases such as diabetes.

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The human body is a complex structure composed of many parts and biological processes whose interactions affect one another. The mouth is a part of the human body and is “the window to your body’s health.”<sup>1</sup> It follows then that oral health is inextricably linked to general systemic health. Health is defined not only as the absence of disease or infirmity, but as a state of complete physical, mental and social well-being.<sup>2</sup> When the mouth is not healthy, the body is not healthy. In 1900, William Hunter, MD, first introduced the concept of oral sepsis to the medical literature in a paper entitled, “Oral Sepsis as a Cause of Disease.”<sup>3</sup> Dr. Hunter wrote of the association of oral infection and systemic disease.

It is through a thorough examination of the oral cavity that one can not only detect oral diseases, lesions and abnormalities but also

systemic diseases and disorders, nutritional deficiencies, disorders of the immune system and cancers.<sup>4</sup> In 1996, Offenbacher coined the term “periodontal medicine.”<sup>5</sup> This is a branch of periodontology that focuses on the strong relationships between periodontal health or disease and systemic health or disease. Furthermore, Miller, another periodontist, initiated the American Academy of Oral Medicine in 1945 and later the American Board of Oral Medicine in 1956.<sup>6</sup>

Periodontal disease is one of the most common chronic infections of humankind.<sup>7</sup> It is an infection caused by dental plaque or plaque biofilm. Dental plaque or the plaque biofilm is the well-organized, heterogeneous structure composed of microbial pathogens, which is the primary etiologic agent for periodontal diseases. It is estimated the prevalence of periodontal disease in adults in the United States (age 20-64) is 8.5 percent and is 17.2 percent in seniors over the age of 65.<sup>8</sup>

The primary causal factor of periodontal disease is microbial pathogenic bacteria referred to as bacterial plaque; the secondary issue is host resistance. There are two main forms of periodontal disease: gingivitis and periodontitis. Both are pathologic periodontal inflammatory processes. The primary causal factor is microbial pathogenic bacteria; the secondary issue is the host resistance. The most common is the plaque-induced gingival disease called gingivitis, which is a reversible form of periodontal disease.<sup>9</sup> The second most common form of periodontal disease is periodontitis. Periodontitis is a destructive, chronic inflammatory process, which results in atrophy or loss of the underlying bone and connective tissue support around the teeth.<sup>9</sup>

It is believed that there are more than 500 species of microbial species that are the primary etiologic agents for periodontal disease.<sup>10</sup> Despite the potential for many pathogens to be associated with periodontal disease, there is a small number most frequently associated with active periodontal disease. Socransky et al. divided the pathogens into two main clusters of microorganisms and deemed them the “red” and “orange” complexes.<sup>11</sup> The red complex includes the following gram-negative, anaerobic pathogens: *Porphyromonas gingivalis*, *Tannerella denticola* and *Tannerella forsythia*. The orange complex pathogens include *Fusobacterium nucleatum*, *Prevotella intermedia*, *Prevotella nigrescens*, *Peptostreptococcus micros*, *Campylobacter rectus*, *Centruroides gracilis*, *Campylobacter showae*, *Eubacterium nodatum* and *Streptococcus constellatus*. Other microbial pathogens highly associated with periodontal disease are *Aggregatibacter actinomycetemcomitans* and *Eikenella corrodens*.

In disease, the putative periodontal

pathogens reside in and colonize the gingival tissue collar that surrounds the tooth, forming a niche called the periodontal pocket. Periodontal plaque biofilm’s access to the gingival circulation through ulceration of the periodontal gingival pocket is a pathway for spread of the biofilm into the systemic circulation. The activation of an inflammatory response, due to the plaque biofilm, results in the production of inflammatory cytokines and mediators, such as interleukin-1 (IL-1 $\beta$ ), IL-6 and tumor necrosis factor-alpha (TNF- $\alpha$ ).<sup>12</sup>

Despite the potential for many pathogens to be associated with periodontal disease, there is a small number most frequently associated with active periodontal disease.

These mediators, whose effects are also systemic in nature, are all means by which periodontal disease may negatively affect a person’s general health.

Periodontal disease is thought to be a risk factor associated with several autoimmune systemic diseases and conditions such as diabetes, rheumatoid arthritis, Sjogren’s syndrome, ankylosing spondylitis and inflammatory bowel disease. An autoimmune disease is defined as an abnormal immune response of the body against a substance or tissue normally present in the body.<sup>13</sup> In many situations, the products of the immune system cause damage to the body. It may be isolated to certain organs or involve a particular type of tissue found in varying anatomic locations.<sup>13</sup> Autoimmune conditions cannot be cured as the characteristic

pathology is T-cells with self-antigens against a particular cell type. However, many autoimmune conditions can be successfully managed with medication and other therapeutic strategies.<sup>14</sup> Studies have suggested that quite frequently someone diagnosed with one autoimmune disorder is often later diagnosed with an additional disorder or disorders.<sup>15</sup>

### Diabetes and Periodontal Disease

Diabetes mellitus, also known as simply diabetes, is a group of metabolic diseases where there is elevated blood glucose levels over a prolonged period of time.<sup>16</sup> The onset of diabetes is preceded by inflammation, leading to pancreatic beta-cell dysfunction and eventual apoptosis or cell death.<sup>17</sup> Diabetes is associated with alterations in carbohydrate, fat and protein metabolism as a result of defects in insulin secretion by the pancreas, beta-cells of the body not responding properly to the insulin that is produced by the pancreas or both.<sup>16</sup> Long-term disease can result in damage, dysfunction or failure of various organs.<sup>16</sup> Diabetes remains the seventh leading cause of death in the U.S.<sup>18</sup> Diabetes is a chronic disease for which there is no known cure. The goal of treatment for the diabetic patient is to maintain blood sugar levels at 6.5 percent or lower, as measured by a specific test known as the HbA1C. The HbA1C is a measure of glycemic (glucose/blood sugar levels) control over time.<sup>19</sup> Higher HbA1C levels are associated with poorer glycemic control and have an impact on diabetes status (i.e., well-controlled versus poorly controlled versus uncontrolled diabetic).

There are three main types of diabetes: type 1, type 2 and gestational diabetes. Type 1 diabetes, previously known as “juvenile diabetes” or “insulin-dependent diabetes” (IDDM), is an autoimmune disease.<sup>20</sup> Type 1 diabetes is characterized

by the body's inability to produce enough insulin because the body's immune system attacks and destroys pancreatic beta cells, the cells that produce insulin.<sup>21</sup> Over time, chronic hyperglycemia develops. There are still many unanswered questions regarding the causes of type 1 diabetes. Type 2 diabetes, previously known as non-insulin dependent diabetes mellitus (NIDDM), usually starts as insulin resistance, which means certain cells of the body, specifically muscle, fat and liver cells, do not respond properly to the insulin being made.<sup>21,22</sup> This results in glucose building up in the blood instead of being absorbed. Over time, as the body's need for insulin increases, the pancreas slowly loses its ability to produce insulin. Risk factors for type 2 diabetes include obesity, aging, family history, physical inactivity, metabolic syndrome and race/ethnicity.<sup>21</sup> Obesity, in particular, is commonly associated with diabetes. Obesity contributes to insulin resistance through the elevation of circulating levels of free fatty acids that come from adipocytes; these fatty acids inhibit glucose uptake, glycogen synthesis and glycolysis.<sup>23</sup> Often beta cell mass in obese patients is reduced by an increase in beta cell apoptosis, which results in a decrease in insulin production.<sup>23</sup> Type 2 diabetes is the most common form of diabetes. Type 2 diabetes is more common in certain cultural groups, including African-Americans, Hispanics/Latino Americans, American Indians and Pacific Islanders.<sup>21</sup> Gestational diabetes occurs in pregnant women with no history of diabetes when not pregnant, but who develop high blood glucose levels during pregnancy.<sup>21</sup>

As of 2012, it is estimated that 29.1 million Americans or 9.3 percent of the population older than age 20 had diabetes, which is an increase from 25.8 million or 8.3 percent in 2010.<sup>18</sup> Of the 29.1 million, 21 million were diagnosed

and 8.1 million were undiagnosed.<sup>18</sup>

Many of those diagnosed with type 2 diabetes deal with long-term complications associated with the disease. Usually these complications develop 10 to 20 years after diagnosis but for those undiagnosed, these complications may be the first sign of the disease. Complications often seen are because of damage to blood vessels, both large and small. Damage to large blood vessels is known as macrovascular disease. Macrovascular disease increases one's risk for cardiovascular

There is approximately a threefold increase in the risk for periodontitis in individuals with diabetes compared to those without diabetes.

disease, stroke and peripheral vascular disease. Diabetes doubles the risk for cardiovascular disease.<sup>24</sup> Approximately 75 percent of deaths from diabetes are because of coronary artery disease.<sup>25</sup> Adults with diabetes have heart disease and stroke death rates approximately two to four times higher than adults without diabetes.<sup>21</sup>

Damage to small blood vessels because of diabetes is known as microvascular disease. Microvascular complications associated with diabetes include damage to the eyes, kidneys and nerves.<sup>16</sup> The blood vessels of eyes can be damaged due to diabetes. This damage is known as diabetic retinopathy.<sup>16</sup> It is the leading cause of new blindness cases in adults aged 20 to 74.<sup>21</sup> Damage to the vessels of the kidneys because of diabetes is known

as diabetic nephropathy.<sup>16</sup> Diabetes is the leading cause of kidney failure and accounted for 44 percent of all new cases of kidney failure in 2011.<sup>18</sup> Often it results in the need for dialysis or kidney transplant and may also lead to death.<sup>21</sup> Damage to the nerves of the body because of diabetes is known as diabetic neuropathy.<sup>16</sup> Diabetic neuropathy is the most common complication of diabetes and is associated with tingling, numbness, pain, muscle wasting and weakness.<sup>16</sup> Diabetic neuropathy occasionally results in amputation.<sup>16</sup> Diabetes has also been associated with cognitive impairment. Those with diabetes have a 1.2 to 1.5-fold greater rate of cognitive decline compared to those without diabetes.<sup>26</sup>

With the compelling amount of potential complications and comorbidities that may result from diabetes, it is easy to imagine the substantial economic burden associated with the disease. In 2012, it was estimated that the total cost of diagnosed diabetes in the U.S. was \$245 million, which included \$176 million for direct medical costs and \$69 million in reduced productivity.<sup>18</sup>

Several oral disorders and diseases have been associated with diabetes mellitus. They include dental caries, salivary dysfunction (such as xerostomia), oral mucosal diseases (such as lichen planus and recurrent aphthous stomatitis), oral infections (such as candidiasis), taste and other neurosensory disorders such as glossodynia and periodontal disease.<sup>27</sup> Periodontal disease has been listed as the sixth leading complication of diabetes.<sup>28</sup> There is approximately a threefold increase in the risk for periodontitis in individuals with diabetes compared to those without diabetes.<sup>29</sup> This increase in risk is associated with the level of glycemic control as denoted by the HbA1C level. Adults with an HbA1C level of > 9 percent had an increased prevalence of

severe periodontitis compared to those without diabetes after controlling for age, race, smoking, sex and education level.<sup>30</sup> It is biologically plausible that chronic inflammation associated with periodontal disease may have an impact on diabetic control, as assessed by the HbA1C level, the development of insulin resistance and type 2 diabetes.<sup>17</sup>

Periodontitis is also associated with an increased risk for diabetic complications. Studies have shown a direct relationship between severity of periodontitis and complications of type 2 diabetes.<sup>17</sup> Moderate-to-severe periodontitis is associated with an increased risk for macroalbuminuria, end-stage renal disease, calcification of atherosclerotic plaques, thickening of carotid vessels and cardiorenal mortality.<sup>17</sup> Researchers have found that diabetic patients with periodontitis had more cardiovascular, cerebrovascular or peripheral vascular events compared to diabetics without periodontal disease.<sup>31</sup> Others have found that the death rate from ischemic heart disease is 2.3 times higher in those with severe periodontitis than those without periodontitis or mild periodontitis.<sup>32</sup>

Inflammation is the central mechanism that links periodontal disease and diabetes. It has been suggested that type 2 diabetes is a manifestation and exaggeration of the host's inflammatory response due to a cytokine-induced acute phase response to the periodontal microflora.<sup>33</sup> Type 1 and type 2 diabetes are associated with increased levels of systemic inflammatory markers.<sup>34</sup> Increases in inflammatory markers such as IL-6 and TNF- $\alpha$  have been found in the obese and those with diabetes.<sup>34</sup> These inflammatory cytokines are also associated with periodontal inflammatory disease and are the main ones associated with upregulation of acute-phase proteins, such as C-reactive protein (CRP). Increases in the levels of CRP have been linked with insulin resistance, type

2 diabetes and cardiovascular disease.<sup>35</sup> IL-6 and CRP levels are also elevated in patients with periodontitis, with the levels of IL-6 correlating with disease severity in periodontitis patients.<sup>36</sup> Bidirectionally, diabetes increases inflammation in periodontal tissues. PGE<sub>2</sub> and IL-1 $\beta$  are elevated in patients with type 1 diabetes that have either gingivitis or periodontitis compared to patients without diabetes with the same level of periodontal disease.<sup>37</sup> Research has shown that patients with diabetes and severe periodontitis have depressed neutrophil function, specifically

A measure of successful diabetic treatment is an outcome where there is a reduction in the HbA1C.

a reduction in PMN activity, impairment with chemotaxis and phagocytosis allowing bacteria to persist in the periodontal gum pocket and thus a significant increase in the destruction of the periodontal attachment apparatus compared to diabetic patients with mild periodontitis.<sup>38,39</sup>

There is a prolonged inflammatory response to *Porphyromonas gingivalis* as denoted by an increase in production of IL-6 and TNF- $\alpha$  in diabetic patients compared to those without diabetes.<sup>39,40</sup> These altered host defense mechanisms and increases in proinflammatory mediators in those with diabetes result in an increase in the level of periodontal inflammation present as well as contributing to increased insulin resistance and poor diabetic metabolic glycemic control.<sup>39,41,42</sup> Improving periodontal

health through treatment has shown to reduce the levels of inflammatory mediators, such as IL-6, TNF- $\alpha$  and CRP, in those with and without diabetes.<sup>43,44</sup> Additionally, it has been suggested that enhanced apoptosis may also contribute to periodontitis as a complication of diabetes, rendering the effect of delayed wound healing, which can be detrimental.<sup>27,45</sup>

A measure of successful diabetic treatment is an outcome where there is a reduction in the HbA1C. Studies have shown that successful periodontal treatment, as denoted by a reduction in periodontal inflammation, results in a reduction of HbA1C at three months in those with type 2 diabetes.<sup>46</sup> This treatment includes mechanical debridement in conjunction with sustained effective oral home care over time.<sup>17</sup> Others have shown that in those with diabetes and periodontitis following nonsurgical periodontal treatment with adjunctive local delivery antibiotic therapy, a reduction in the circulating levels of TNF- $\alpha$  is seen.<sup>44,47</sup> Additionally, Iwamoto et al. found a reduction in TNF- $\alpha$  levels was accompanied by and strongly associated with a decrease in HbA1C levels.<sup>44</sup> This suggests that periodontal therapy, aimed at reducing periodontal inflammation, may restore insulin sensitivity thereby improving glycemic control.<sup>23,41,48</sup>

Definitive conclusions regarding the impact of periodontal treatment on glycemic control in type 1 diabetic patients cannot as yet be made. Studies have shown no changes in the HbA1C after periodontal treatment in the patient with type 1 diabetes despite an increase in risk for developing periodontal disease.<sup>49,50</sup> It has been suggested that perhaps the differences in the effects of periodontal treatment in patients with type 1 versus type 2 diabetes may be because of differences in etiologies for the conditions.<sup>51</sup>

## Conclusion

Many studies have established an association between periodontal disease and diabetes. Support has been provided describing plausible biological mechanisms by which periodontal disease may also contribute to diabetes and in which diabetes negatively influences periodontal disease. There is a vast amount of data that demonstrates an association relationship between periodontal disease and diabetes. Future studies may demonstrate the efficacy of periodontal therapy related to positive outcomes with regard to aiding success in the treatment of diabetes.

Current data and risk benefit ratios support the importance of periodontal therapy utilized to support periodontal health. Periodontal therapy does reduce periodontal inflammation and improves periodontal status. Therefore, the treatment of periodontal disease is beneficial in any population that is susceptible to periodontal disease, including those at risk for type 2 diabetes mellitus. Preventive treatment, in any population, is the best way to reduce the risk of periodontal disease.

Although all of the answers regarding the relationship between periodontal disease and diabetes are yet to be determined, it is important for dentists to educate and inform our physician brethren and patients concerning the possible advantages of periodontal therapy to aid in advancing the health of diabetic patients. ■

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# Atypical Presentation of Zoster Mimicking Headache and Temporomandibular Disorder: A Case Report

Mohammad Reza Zarei, DDS, MSc, and Goli Chamani, DDS, MSc

**ABSTRACT** Herpes zoster in the prodromal stage may be mistaken for other diseases characterized by pain in the area of prodrome, such as dental pain. We report on a case of trigeminal herpes zoster, which presented as sudden onset headache and acute temporomandibular pain in the prodromal phase.

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*Conflict of Interest*  
*Disclosure: None reported.*

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Varicella zoster virus (VZV), a member of the herpes virus group, causes two types of infections in humans: chickenpox (varicella), the primary disseminated infection that usually occurs in children, and shingles (herpes zoster (HZ)), the secondary restricted dermatomal form of infection that results from reactivation of the endogenous virus that has remained latent in the ganglia of sensory cranial nerves and spinal dorsal root ganglia after primary infection.<sup>1</sup> HZ typically occurs in immunocompetent people usually older than age 50, patients with cell-mediated immunodeficiency (e.g., patients with lymphoproliferative disorders or HIV infection), organ transplant recipients and patients on immunomodulating medications (including corticosteroids).<sup>2</sup> However, it can occur in children and healthy young people.<sup>3</sup> Reactivation

of VZV in immunocompromised patients can lead to a disseminated life-threatening visceral infection.<sup>2</sup>

HZ usually begins with a prodromal phase, during which patients experience sensory symptoms, including pain, in the affected dermatome. The pain is described as “burning,” “electrical,” “throbbing” or “stabbing.” Itching and tingling can also occur.<sup>4</sup> The sensory symptoms usually precede the active stage of the disease by a few hours to several days (typically two to three days) and may persist for weeks or months after the skin lesions heal.<sup>5,6</sup> The active stage is characterized by the evolution of skin and mucosal lesions in the affected dermatome. The rash starts as erythematous maculopapular eruptions that progress to vesicles, pustules and crusts within seven to 10 days and can persist for up to 30 days.<sup>2,5</sup> Skin lesions are usually localized to one or two adjacent dermatomes without crossing the body’s midline. Thoracic

nerves and the ophthalmic division of trigeminal nerve are the most common sites of involvement.<sup>2</sup> Constitutional symptoms such as fever, malaise or fatigue are present in fewer than 20 percent of patients.<sup>6</sup> HZ in the prodromal stage, in the absence of skin lesions, may be mistaken for other diseases characterized by pain in the area of prodrome, such as myocardial infarction in the case of thoracic nerve involvement or dental pain in the case of trigeminal nerve involvement, leading to misdiagnosis and, potentially, mistreatment.<sup>6</sup> We present a case of herpes zoster of the trigeminal nerve that presented as a sudden onset unilateral headache and temporomandibular pain.

### Case Report

In September 2013, a 36-year-old male patient was referred from the department of neurology to the orofacial pain and headache clinic at the Kerman School of Dentistry in Kerman, Iran, because of sudden onset pain in the left side of the face and head. According to the patient, the symptoms began as a severe new headache and soreness in the left temporal area four days prior to his appointment. Because of the severe nature of the headache, the neurologist had ordered a brain CT to rule out intracranial pathology, which was clear, and a complete blood count and erythrocyte sedimentation rate (ESR), which were within normal limits. With a diagnosis of migraine, the patient was put on naproxen 500 mg bid and given an injectable dose of dexamethasone (4 mg IM). Although the pain was relieved to some degree with this treatment, it moved downward and involved the left side of the face, including the left temporomandibular joint in addition to the temporal area. The patient described the pain as a continuous, deep, dull, aching pain of mild severity

with an intensity of three out of 10 on the visual analogue scale in the left side of the mandible, left temporomandibular region and left temple. Brief attacks (less than five seconds) of severe, sharp, shooting, lancinating pain with an intensity of nine out of 10 were superimposed in the background of continuous pain in the left temporal area. The patient also complained of limitation in the opening of the mouth, pain on chewing food and discomfort inside the mouth. The patient did not report any abnormal sensation such as numbness or tingling in the affected area. Photophobia, phonophobia, nausea, vomiting and autonomic features were not associated with the pain. The patient's past medical history was unremarkable.

On examination, the skin overlying the affected area appeared normal. The patient's vital signs, including body temperature, were within the normal ranges. The cranial nerve examination was within normal limits. Static and dynamic mechanical allodynia was present on the skin of the left temple but not on the left side of the face. Stomatognathic examination revealed severe limitation in the mandibular range of motion. The active opening was 30 mm and the passive opening was 48 mm (soft-end feel). The right laterotrusion range was less than the left laterotrusion range (8 mm versus 10 mm). A deflection to the left side was noticed during opening of the mouth. The bite was stable. Biting on a tongue blade on the right and left side aggravated the pain in the left temporomandibular area. Intraoral examination showed multiple vesicles and coalescing small ulcerations on an erythematous base covered by whitish fibrinous membrane on the left buccal mucosa and pterygomandibular raphe (**FIGURE 1**). Intraoral examination also revealed the presence of tongue and cheek ridging and severe attrition



**FIGURE 1.** Vesicles and coalescing small oral ulceration on an erythematous background can be seen on the left buccal mucosa four days after symptoms began.

of the teeth. Examination of the temporomandibular joints showed that lateral and dorsal capsule of the left temporomandibular joint was severely painful. Palpation of the major muscles of the neck, head and face revealed several active myofascial trigger points in the upper trapezius, splenius capitis, superficial and deep masseter, temporalis and sternocleidomastoid muscles on the left side. Although palpation of all of these muscles referred pain to the affected area, the sternocleidomastoid muscle on palpation severely aggravated the patient's pain. An injection of 0.5% lidocaine into the sternocleidomastoid trigger point, which elicited a twitch response, reduced the patient's pain significantly (more than 50 percent based on the visual analogue scale) and improved the mandibular range of motion immediately (active opening increased from 30 mm to 41 mm after anesthetic injection). With a working diagnosis of herpes zoster, capsulitis and myofascial pain, we put the patient on 800 mg of acyclovir five times a day (for seven days), 300 mg of gabapentin at bedtime, 500 mg of naproxen two times a day, a soft diet and a myofascial protocol that included stretching of the involved muscles and applying moist heat at regular intervals. The patient was also instructed to rinse three times a day with 0.12 chlorhexidine digluconate. The patient returned to our clinic the next day because lesions had appeared on his skin.



**FIGURE 2.** A cluster of erythematous umbilicated papules and vesicles, which appeared on the left temple skin five days after symptoms began.



**FIGURE 3.** Intraoral lesions on day five.

On examination, classic lesions of herpes zoster were noticed on the skin of the left temporal area (**FIGURE 2**). An intraoral examination showed that oral ulcerations involved most of the left buccal mucosa (**FIGURE 3**). The patient also mentioned that his pain had reduced significantly during the past 24 hours. The patient was seen again three weeks later. The skin and oral lesions had disappeared completely without leaving scars. The patient did not report any pain or sensory deficit in the affected area, except for a mild dysesthesia in the left temporal area. The mandibular range of motion was within normal limits and the left lateral and dorsal capsule was not painful on palpation.

### Discussion

The incidence of HZ infection in studies of immunocompetent individuals has been reported to be between 1.2 and 3.4 cases per 1,000 persons per year.<sup>6</sup> Although the greatest risk factor for herpes zoster is age, owing to a decrease in cell-mediated immunity, it can also develop following psychological stress, dramatic life events and traumatic injuries to the dermatomes.<sup>2,5,7</sup> Involvement of thoracic dermatomes is the most common presentation of HZ, accounting for two-thirds of cases.<sup>8</sup> Trigeminal herpes zoster infection, which is characterized by the appearance of lesions on the face, mouth, eyes or tongue, accounts for 18.5 percent of cases.<sup>9</sup>

HZ occurs when VZV-specific cell-mediated immunity declines and can no longer contain the virus. This is followed by replication of the latent virus and severe inflammation and hemorrhagic necrosis of nerve cells. VZV then migrates down the neural pathway, usually causing intense neuritis and eventually skin rash.<sup>2,5</sup> In the presence of an ongoing inflammation, nociceptors become physiologically sensitive (peripheral sensitization), which is characterized by spontaneous ectopic discharge, a lowered activation threshold for normally innocuous thermal and mechanical stimuli (allodynia), and an enhanced discharge to suprathreshold stimulation (hyperalgesia).<sup>10</sup> This sensitization results from the antidromic release of vasoactive substances such as calcitonin gene-related peptide (CGRP) and substance P and increased sensory neuron exposure to molecules such as nerve growth factor (NGF).<sup>11</sup> Prolonged or massive input from nociceptors also activates N-methyl-D-aspartate (NMDA) receptors on the second-order neurons and leads to central sensitization, which is characterized by the spread of pain beyond the territory of the affected nerve.<sup>10-12</sup> In addition to acute prodromal pain, these changes could lead to postherpetic neuralgia (PHN), which is the most common complication of HZ. PHN exists when significant pain or dysesthesia persists or recurs for more than 30 days after

rash healing.<sup>2</sup> Advanced age, greater severity of the rash and greater acute pain intensity are the most important risk factors for PHN.<sup>6,12</sup> Studies have shown that antiviral treatment, especially when started within 72 hours of the onset of the HZ rash, reduces the severity and duration of acute pain.<sup>13</sup> However, a recent *Cochrane Review* concluded that antiviral treatment did not have a significant effect on the incidence of PHN after four or six months compared to placebo.<sup>14</sup>

In our case, HZ of the trigeminal nerve presented as severe pain in the temporal area and temporomandibular joint. It seems that severe pain in the left temporomandibular joint led to protective muscle splinting, diminished range of mandibular movement and activation of the latent trigger points in masticatory muscles and other major head and neck muscles. In the absence of typical lesions of HZ, the patient was diagnosed with a case of severe migraine and was inappropriately treated with a corticosteroid injection. Diagnosis of HZ in the prodromal phase can be extremely difficult, as the skin rash is a major diagnostic feature.<sup>12</sup> However, in our case, sudden onset of severe pain in the temple region and rapid enlargement of the area of pain in a previously asymptomatic healthy patient, superimposed paroxysmal sharp, shooting, lancinating pain in the affected area and the presence of dynamic mechanical allodynia, which is not a common finding in temporomandibular pain, should raise an alarm for suspicion of unusual causes of pain such as HZ. Because severe acute pain is a risk factor for PHN, effective relief of prodromal pain in HZ is of paramount importance. In our case, an injection of 0.5% lidocaine into the trigger points of the involved muscles relieved the acute pain significantly and should be considered in cases of HZ that present as temporomandibular pain. ■



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# A National Survey of Positional Leadership Trajectories of U.S. Dentists

David Chambers, EdM, MBA, PhD

**ABSTRACT** An electronic survey was responded to by 233 fellows of the American College of Dentists and by 586 graduates of four dental schools. Rate of involvement and weighted number of leadership positions held gradually increased until about age 45 to 50, then declined more steeply. Leadership potential manifested itself as early as dental school and the characteristics most associated with leadership were professionalism and a strong ethic, while available time and personal sacrifice were not regarded as great drawbacks.

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There are multiple theories about the way leadership is exercised, but the general agreement is that leadership is a consistent capacity to influence the behavior of others toward a goal that they accept as important to them and by means, they welcome. It is interpersonal, positive and general and can be registered in the behavior of identifiable groups. One is not a leader in the abstract.

The most widely accepted views of leadership include the following:

*Positional leadership* is exercising the influence of an independently existing office.<sup>1-2</sup> The leader combines his or her effectiveness with the power of the office, usually for a fixed period of time. The leader is expected to perform certain functions and may be allowed to perform others while in office that

would be inappropriate before or after assuming the position. This may be spoken of as “going through the chairs” or “ascending the hierarchy.” Usually, such leadership is achieved by formal election or appointment, and there is a pyramid with fewer positions at higher levels. Frequently, “leadership training” in organized dentistry consists of a day where newly elected officers are introduced to staff members, learn about organizational structure and receive mandatory training on intellectual property, human relations and access to and responsible use of organizational assets. All formal organizations use positional leadership, although this is often supplemented by other approaches depending on the personal style of incumbents and on situations, such as emergencies faced by the organization.

*Transactional leadership* is a style based on exchange.<sup>3-5</sup> This is also known as brokered or political leadership or leader-member exchange (LMX) theory.<sup>6</sup> Politicians, for example, can “open doors,” fill positions, block initiatives and steer resources in exchange for quid pro quo resources, the prospect of future favors or loyalty. The most effective transactional leaders are those in the center of rich networks who work the exchanges to the general benefit of those they represent.

Bernard Bass popularized *transformational leadership*, a view that empowers others in organizations to take greater personal responsibility.<sup>7</sup> Human dynamics play a large role in transformation approaches. Often the organization is “flattened” in this model to encourage freer participation. Sometimes alternative organizational structures are used — such as cooperate practice models or “academies” and “institutes” to empower those who do not have access to traditional organizational structures.

*Charismatic leaders* manifest personal charm that inspires confidence and a sense of wanting to be associated with the leader or his or her causes.<sup>8-9</sup> Discipleship or the mentor-protégé relationship is a strong form of charismatic leadership, but in its most general sense it involves articulating a cause that others can believe in and an expectation that those close to the leader will prosper in the future.

*Servant leadership* is based on empowering others as they contribute to a common goal in the group.<sup>10</sup> The ministry, sometimes education, and the helping professionals tend to embrace aspects of servant leadership, as do voluntary causes and the new movement toward social entrepreneurship.<sup>11</sup> Also known as stewardship, this form of leadership is highly situational and context specific.

A more comprehensive taxonomy of

leadership in terms of task, relationships, change or response to external conditions was recently proposed by Yukl.<sup>12</sup> An individual could manifest leadership in any or several of these ways, shifting emphasis over a career and depending on the prevailing conditions. The five most commonly mentioned styles are presented here in order from the most formal and structured to those most dependent on personal characteristics and values. Any style or combination of styles might be needed in a particular situation where leadership is called for.

Participation in organized dentistry or one’s community was felt to be lesser indicators of leadership.

Despite its being a favorite topic in reports and editorials in dentistry, leadership has not been well described in the professional literature. The recent paper by Forest et al.<sup>13</sup> is the only national study to date of how dentists view themselves in leadership roles. It was reported there that dentists consider their primary leadership function to consist of earning recognition for running an effective dental practice — emphasizing the relationship between dentists and patients or dentists and staff rather than dentist and dentist. Participation in organized dentistry or one’s community was felt to be lesser indicators of leadership. Fewer than half of the respondents reported feeling effective or very effective in

leadership roles in the profession, and they cited conflicting obligations of practice and family and a perception that they were “too old” for leadership as reasons for reduced participation.

This paper extends the nascent work in understanding leadership among dentists. A computerized survey gathered 819 responses from graduates of four dentals schools and fellows of the American College of Dentists (ACD) regarding their definition of the characteristics of leadership and self-reports of their participation in leadership positions in organized dentistry and in their communities in decade time slices across their lifetimes. The intent was to describe a leadership career path or trajectory. Of particular importance was the question of whether leadership potential can be predicted from early participation.

This work focused on positional leadership — being recognized by one’s colleagues and peers — and afforded opportunity to combine personal leadership characteristics with formal authority associated with established positions in the profession or the community.

## Materials and Methods

This project was given exempt status by the Institutional Review Board (IRB) at the University of the Pacific, Nos. 14-13, and by the IRB of the one other participating university whose policies require review for collaborative exempt projects.

The survey instrument included seven Likert scale items characterizing dental leadership and a question about desire for more young dentists in leadership roles and another regarding willingness to mentor young dentists. Current age and age of first leadership position following dental school were reported. Respondents were asked to

TABLE 1

**Participating in Leadership in Organized Dentistry, Education or Research by Age Segment for Level of Responsibility and Size of Constituency, Data Combined Across Fellows of the American College of Dentists and Four Dental Schools for Rate of Participation and Number of Positions Held**

Age Segment		Local, Component			State, Regional			National, International			Total
		Top	Other	Member	Top	Other	Member	Top	Other	Member	
Student	Participation (%)	0.18	0.25	0.34	0.07	0.09	0.19	0.03	0.07	0.17	0.56
	No. of activities	1.34	1.65	1.96	1.72	2.29	2.01	1.23	1.59	1.73	2.41
> 36	Participation (%)	0.17	0.26	0.38	0.08	0.20	0.30	0.03	0.08	0.23	0.54
	No. of activities	1.30	1.92	2.14	1.30	1.69	2.11	1.46	1.57	2.05	2.97
36-45	Participation (%)	0.19	0.25	0.38	0.13	0.26	0.33	0.05	0.13	0.25	0.60
	No. of activities	1.28	2.00	2.26	1.32	1.87	2.29	1.24	1.75	2.19	3.81
46-55	Participation (%)	0.12	0.18	0.33	0.15	0.25	0.32	0.09	0.16	0.30	0.50
	No. of activities	1.36	1.92	2.24	1.45	2.05	2.51	1.43	1.98	2.42	4.09
56-65	Participation (%)	0.07	0.12	0.30	0.11	0.20	0.31	0.07	0.16	0.28	0.46
	No. of activities	2.17	3.53	3.23	2.03	2.76	3.59	2.54	3.03	3.87	3.07
> 66	Participation (%)	0.01	0.04	0.16	0.02	0.05	0.13	0.03	0.05	0.12	0.14
	No. of activities	1.17	1.44	1.51	1.35	1.34	1.97	1.23	2.34	2.28	0.64
Career	Participation (%)	0.42	0.49	0.56	0.28	0.41	0.47	0.13	0.28	0.40	0.69
	No. of activities	0.84	1.77	3.28	0.63	1.62	2.83	0.30	0.88	2.28	0.21
Community	Participation (%)										0.54
	No. of activities										4.95

Number of activity during each age segment is average number of activities per participating dentist; number of career and community activity is the average for all dentists, participants and nonparticipants.

complete a 3-by-3 matrix reflecting their involvement in leadership activities while in dental school and graduate education and a separate such matrix for each of the decades following formal training. One of the dimensions of these matrices concerned extent of responsibility, with three categories: top officer, other officer or active membership with program responsibility. The other dimension involved size of constituency, with the three categories, including the school or program, state or regional organizations, and national and international organizations. For the smallest leadership constituency size “school” was replaced by “local” in each decade after graduation. Respondents entered the number of leadership positions held in each of

the nine boxes for each time template. The same 3-by-3 template of leadership level and constituency was presented for the period from the end of formal training up to age 35, and then for 10-year age slices to age 65 and finally from age 66 and beyond. Because subjects entered their current age at the beginning of the survey, the computer only displayed leadership templates appropriate to each respondent.

Respondents also reported level of involvement, but not size of constituency, for community leadership activities once over their entire careers. Involvement in alumni activities was also reported for respondents other than ACD fellows. This information was reported individually to the schools, but is not reported here.

Because leadership is open to various interpretations, an effort was made to

focus respondents’ attention on positional leadership in organized dentistry and dental education and research by providing a definition on the survey form immediately preceding the first responses:

- Top officer equals president or leader of entire organization.
- Other officer equals committee chair, vice president, delegate, regent.
- Active member equals committee membership, project coordinator, volunteer, alumni representative (but NOT dues-paying member without assignment).

Belonging or attending without substantial responsibility for specific tasks should not be reported on this survey.

In order to further standardize the reporting of leadership activities, an example was provided for how to

TABLE 2

### Correction Factors Based on Regression Analysis Used to Normalize Reported Leadership for Level of Office Held, Size of Constituency and Censoring in Age Segments

Weights for level of office held				Weights for size of constituency			Weights for censoring in age segments			
	Top	Other	Member	Local	State	National	36-45	46-55	56-65	66+
Component, local	2.30	1.06	0.61	0.82	0.95	1.38	0.31	0.25	0.01	-0.11
State, regional	2.59	1.01	0.62							
National, international	3.69	1.23	0.52							

count activities: “In each field, enter the number of activities. For example, being on three committees — the chair of one and then going through the positions of secretary, president-elect and president — translates to three ‘active members,’ three ‘other officers’ and one ‘top office.’ Count the same position held for multiple years just once. But if leadership roles extend across difference decades (different screens on this survey), count them in both periods.” Because respondents provided descriptions of activities as well as numbers in many cases, these were used to verify correct reporting.

The survey was administered electronically to all fellows of the ACD with active email addresses and to alumni of four dental schools with active email addresses. There were 4,200 invitations to participate in the first group and 16,750 in the second. The four participating schools were selected to be broadly representative of American dentists: a large, private school on the East Coast with a strong reputation for clinical excellence, a small state school with a balanced program in the Midwest, a large state school with a tradition of serving a wide geographic area of states without dental schools and a mid-size state school on the West Coast with a high National Institute of Dental and Craniofacial Research (NIDCR) ranking for research funding.

The president of the ACD and the deans of the four participating

dental schools approved the project and an email cover letter containing a link to the survey was sent over their signatures to fellows and alumni inviting participation. The survey remained open for 15 days from its posting, although virtually no responses were received after one week. The survey was pilot tested among regents of the ACD, administrators in the participating schools and faculty members at a school that was not part of the final sample.

Descriptive statistics such as averages and percentages were calculated and analyzed by analysis of variance (ANOVA) and correlation analysis. Regression analyses were used to determine weightings for leadership at various levels in the hierarchy of organizations and in organizations of local, regional or national scope and to correct for the time censoring of respondents who had completed only parts of any age segment. A factor analysis was performed to test the underlying structure of opinions regarding leadership.

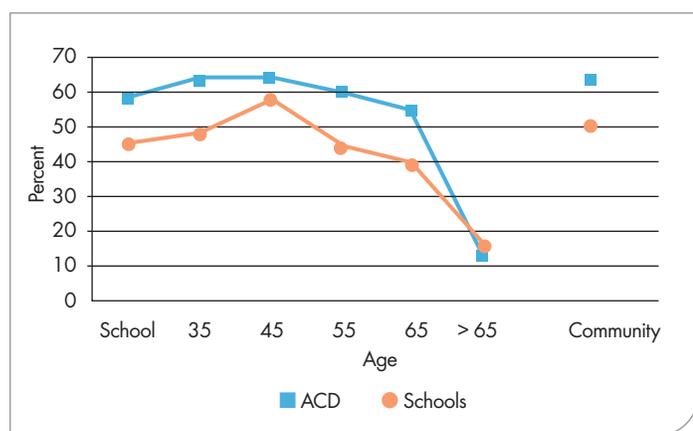
### Results

TABLE 1 shows the percentage of dentists reporting participation as top leaders, other leadership positions or active membership at the local, state or regional, and national and international levels across each age segment. Also shown are the average number of positions held per dentist who reported any leadership activity. It was apparent that top positions are

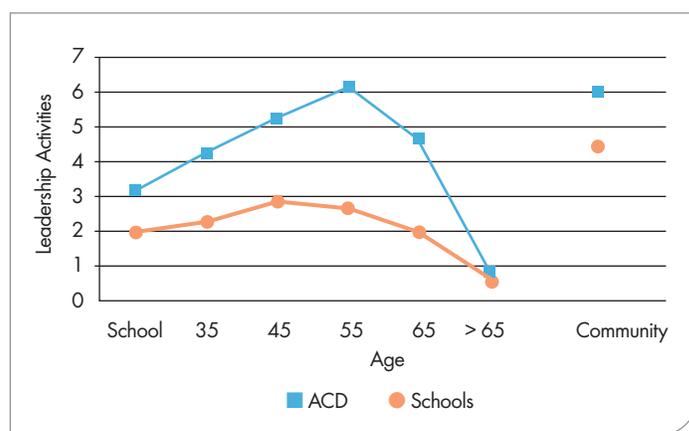
less common than are other leadership roles, which in turn are less common than active membership without a leadership office. It was also apparent that leadership generally was more common at the local level than the state or regional level, and finally least likely at higher levels. Generally, both participation and number of positions held increased with age until mid-career, when it dropped precipitously.

FIGURE 1 shows the age trend for leadership rates among respondents. This is the proportion of dentists who reported any leadership activity, regardless of level or size of constituency, during each of the age segments. The leadership trajectories are graphed separately for ACD fellows and for alumni of the four participating schools. All differences between groups were statistically significant based on ANOVA of at least  $p < 0.01$ , with the exception of participation among dentists older than age 65. The standard error for these point estimates is approximately 2 percent, so changes in rate of participation from one age segment to any other of 4 percent or more can be regarded as statistically significant. The trend was similar for both groups, showing a high and gradually increasing rate of leadership peaking at about age 45, followed by a steeper decline, with a sharp drop after age 65.

Raw reports of participation for the single construct “leadership” should be corrected where possible for contextual



**FIGURE 1.** Percentage of any leadership participation (“rate” of leadership) across career segments for fellows of the American College of Dentists (ACD) and for a sample of graduates from four dental schools.



**FIGURE 2.** Number of leadership positions held (“weighted participation”) adjusted for level of responsibility and size of constituency across career segments for fellows of the American College of Dentists (ACD) and for a sample of graduates from four dental schools.

factors such as level of responsibility and size of constituency. For example, serving as an ADA trustee is not equivalent to being on the planning committee for an event at a dental school. Further, adjustments are necessary to balance the leadership contribution of a 39-year-old dentist who is only three years into a reporting segment on the survey with a colleague who is 45 years old and has finished the entire age segment used for reporting.

Separate normalizing factors were calculated using regression techniques across leadership levels for each of the sizes of constituency. Heavier weight was given to top offices and lighter weight to active membership based on the frequency with which such positions were reported on this survey. These weights are shown in **TABLE 2**. At the local level, it was 3.8 times as likely (2.30/.61) that an individual had served as an active member than in a top position. At the national level, the ratio of such positions was 3.69/.52, or more than seven times as likely to be an active member as compared to a top position. Participation also became less common as the size of the constituent group increased. As shown in **TABLE 2**, local and state positions were about 50 percent more accessible than national ones.

The correction for age censoring ensured appropriate time opportunity adjustments to all respondents regardless of whether they had just begun or had completed all of the time in the final time segment. The regression factors in **TABLE 2** can be thought of as the “rate of change” in leadership during each segment. Accelerating participation was greatest in the 36- to 65-segments, leveling off for a decade and then falling dramatically.

The order of application of the various corrections was level of office, size of constituency and finally age censoring. The corrections were expressed on a scale that does not alter the average total participation; the only adjustments made were to the internal or relative impact of various contextual factors. By applying such corrections and counting only segments that each respondent had reached, it is possible to construct a normalized estimate of points representing average weighted leadership participation during each segment of dentists’ careers. The regression factors in **TABLE 2** were used to calculate weighted leadership participation scores for each respondent. A 40-year-old dentist who reported being on two school committees for the International Association for Dental Research would have an uncorrected

leadership participation score of 2.0, just the same as a colleague who was a department chair and vice-president of the state dental association. Applying the adjustments developed by comparing relative frequency of levels and consistencies, the first dentist would have a corrected, weighted participation score of approximately 1.0 (2.0 x .61 x .82) and the second dentist would have a weighted participation score of approximately 3.0 (2.30 x .82 + 1.01 x .95). The average participation across dentists is still 2.0 leadership positions, but the second individual has been given a weighted participation score three times as large based on level of leadership and size of constituency served. Both dentists would have their participation scores promoted by .31/10 for each of the five years remaining in the 36 to 45 age segment so they could be compared with the typical dentist who had completed the full age segment, thus having had more opportunity for leadership. Dentists who reported 40 years of “dues paying membership in the ADA and 40 years in Rotary” would have a weighted leadership participation score of 0.0 because membership without assuming responsibility for the effectiveness of the group was not counted as leadership in this study.

TABLE 3

## Opinions Regarding Characterization of Leaderships and Personal Views

	Critical	Very important	Important	Nice	Mean	SD
Personally epitomizes ethics and professionalism	75%	22%	3%	<1%	1.29	0.544
Has rich interpersonal skills, builds trust, motivates	54	40	6	<1	1.53	0.632
Faces tough issues, engages those with different views	53	40	7	<1	1.54	0.637
Speaks particularly about issues facing the profession	52	42	6	<1	1.55	0.621
Builds a strong team with many skills and contacts	50	42	8	<1	1.60	0.664
Builds participation, finds, mentors new leaders	42	47	10	2	1.71	0.714
Builds consensus, includes all affected by decision	43	43	12	2	1.73	0.749
Spends the time, available, sacrifices some of own life	25	45	22	8	2.12	0.877
	Certainly	Probably	Probably not	Certainly not		
Dentistry should have more young leaders	57%	36%	6%	<1%	1.50	0.644
I would be willing to mentor a qualified young leader	36	39	21	4	1.93	0.861

Mean is calculated with 1 = critical, 2 = very important, 3 = important and 4 = nice, or in that order from certainly through certainly not. A post hoc Shaffé analysis identified three distinct groups for the seven characterizations of leadership: ethics, consensus and time and the four intermediate questions.

**FIGURE 2** displays the trajectories of ACD fellows and alumni of four dental schools expressed as weighted number of positions held. The units on the vertical axis reflect the number of positions held adjusted for the level of leadership and the size of the constituency. This bow-shaped path mirrors the rate of participation shown in **FIGURE 1**, with a peak at about age 45. The trajectory for ACD fellows shows a greater extent of participation and a longer period of service, most likely reflecting participation at higher levels of leadership and in organizations with greater constituent size. All differences between the two groups, except for those older than age 65, are significant by the ANOVA test at  $p < 0.001$  or smaller. The standard errors for the individual point estimates are 0.03 positions or smaller, meaning that differences across age segments of 0.06 or greater denote statistically significant changes.

Leadership participation was not uniform across respondents. **FIGURE 3** is a frequency distribution showing the proportion of respondents reporting various levels of weighted participation in leadership. The curve shows a geometrically declining rate. Approximately a quarter of respondents reported no leadership

participation, with another 20 percent reporting 10 or fewer activities over their careers. In the middle segment of the graph, between 20 and 60 leadership engagements over a career, ACD fellows were statistically significantly more likely to be represented than were nonfellows ( $p < 0.001$  by test for differences in proportions). In the tail where very large amounts of leadership were found, there were almost no respondents other than fellows of the ACD.

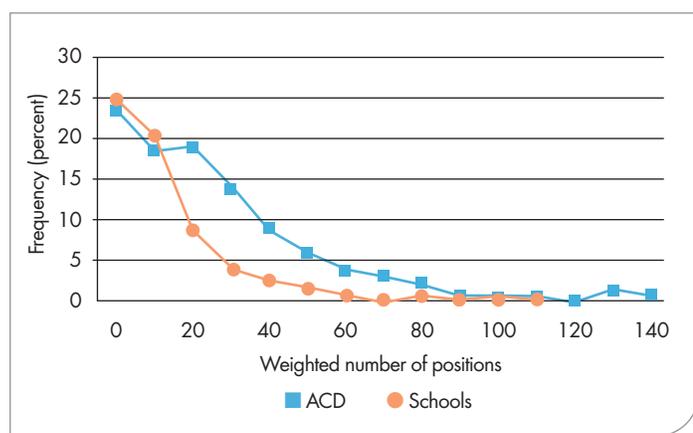
**TABLE 3** summarizes results for opinion questions. Respondents rated seven characteristics of a leader in dentistry using a Likert scale anchored at “critical” and “nice.” These responses were coded on a 4-point numerical scale, with a value of 1.0 representing strongest endorsement of the characteristic. ANOVA with post hoc Schaffé analysis was used to detect natural groups in weight given each of these characteristics. Personal embodiment of ethics and professionalism was deemed most essential. The relatively least important aspects of leadership were consensus building and willingness to sacrifice one’s personal life. The other four characteristic defined a middle group. Principle components factor analysis was performed, using a varimax rotation, to determine whether there was an underlying structure in these

characteristics. Only a generalized factor emerged, suggesting that leadership is viewed as a unitary construct rather than there being distinct sets of traits. Fellows in the ACD were sufficiently more likely to call out ethics, consensus building and mentoring as defining features of leaders ( $p < 0.01$ ) than were alumni from the four schools.

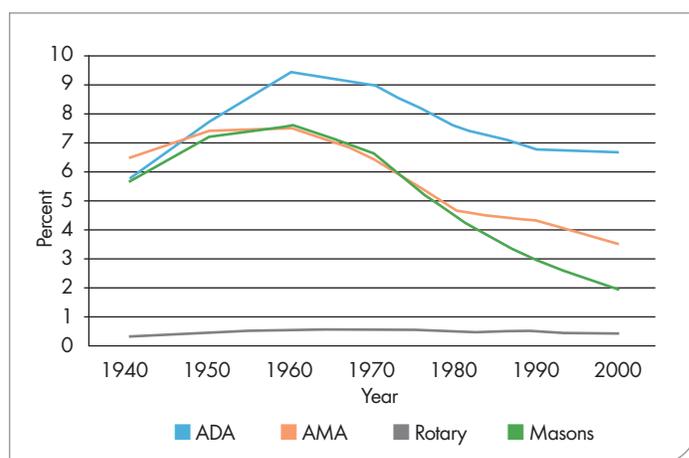
Although none of the associations was dramatic, there were significant correlations ( $p < 0.05$ ) between respondents’ ages and their opinions. Younger dentists were more likely to see leadership as involving good interpersonal skills ( $r = 0.094$ ) and less likely to consider leadership a time drain ( $r = -0.158$ ). They were also more willing to offer to be a mentor ( $r = 0.091$ ).

All but 7 percent of respondents agreed with the opinion that there should be more young leaders in dentistry and 75 percent indicated a personal willingness to mentor qualified young leaders. Fellows of the ACD were significantly less likely to favor young dentists in leadership positions but more willing to mentor young dentists ( $p < 0.05$  by Pearson correlation coefficient).

The average age of respondents was 56.01 (SD = 13.84). The average age at which respondents first held elected or appointed positions in organized



**FIGURE 3.** Frequency distribution of weighted career participation in leadership for fellows of the American College of Dentists and for a sample of graduates from four dental schools.



**FIGURE 4.** Secular trend of memberships in selected professional and service organizations as a percentage of eligible individuals. (Source: Putnam RD. *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon & Schuster, 2000.)

dentistry was 27.86 (SD = 14.85). Those who became active in organized dentistry at an early age were more likely to characterize leadership in terms of facing tough issues ( $r = 0.071$ ), consensus building ( $r = 0.110$ ), ensuring participation ( $r = 0.106$ ) and involving time sacrifices ( $r = 0.084$ ). They were also significantly more likely to favor leadership participation by young dentists ( $r = 0.084$ ) and to express willingness to mentor colleagues ( $r = 0.147$ ).

Weighted participation in dental leadership across age segments followed a simplex pattern with higher correlations between contiguous age groups and gradually diminishing associations as the number of years separating segments increased. The anchor age segment of maximal participation in the 46 to 55 age group was correlated with participation at other ages. Leadership participation in dental school was correlated ( $r = 0.290$ ) with maximal involvement;  $r = 0.253$  for the period from end of training until age 35;  $r = 0.434$  for ages 36 to 45; and on the other side,  $r = 0.583$  for 56 to 65; and  $r = 0.235$  for the oldest age cohort. Respondents' lifetime weighted leadership participation in organized dentistry was significantly associated

( $r = 0.401$ ) with lifetime involvement in community leadership. All of these associations are highly significant.

### Discussion

Based on a sample of 586 graduates of four U.S. dental schools and 233 fellows of the ACD who responded to an electronically distributed survey it appears that both rate of involvement and weighted participation in positional leadership in dentistry was high beginning in dental school and gradually increased to about age 45, then began a more pronounced decline, with a rapid drop following at about age 64. Participation was not uniform, with a quarter of dentists not reporting any leadership activities and a small handful being very deeply involved.

Critical to the confidence of claims based on survey data is the representativeness of the sampling. The four participating schools included a diversity of geographic, class size, state or private affiliation and research intensity characteristics. The fact that there were no differences in any of the results across schools suggested that the sample was representative with respect to leadership. The average age of survey respondents was 56.1 (with a wide standard deviation

of 13.8). This compares with a generally reported average age of practicing dentists of about 50 years. The deans of participating schools were asked to estimate the number of leadership positions of any type available in school and the class sizes at their schools. Leadership opportunities at all levels were judged to be available for about 42 percent of students in the participating schools. In the survey, 46 percent of respondents reported leadership activity while in school. Thus, there is a slight tendency for more active early leaders to have responded to the survey. The response rate for this electronically administered survey was 5.5 percent for ACD fellows and 3.5 percent for dentists from the four schools. These response rates are in line with other studies using this method. Measurement error on surveys is a function of the absolute, not relative, sample size. The standard errors of measurement were very small compared with the regularities in patterns of responses observed.

Because of the paucity of published research in this area, the results are perhaps best compared with general expectations. Those who have seen the results have been most taken by the fact that leadership in dentistry peaked in the age range of 45 to 50

years. Participation rate by younger dentists was only slightly less than in the years of maximal involvement, raising some doubts regarding the claim that younger dentists avoid professional responsibilities because of the demands of establishing a practice and raising a family. Participation in leadership in dental school and during the early years of one's career was predictive of both later participation rate and level of participation throughout one's career. The fact that participation weighted for level of responsibility and size of constituency reached its highest point about five years later than maximum participation rate reflects the fact that leadership positions in dentistry have some characteristics of a tournament, where competition for a smaller number of positions is typical of the higher offices and past officers have few formal opportunities.

The rate at which dentists withdrew from participation in leadership is steeper than the rate of becoming involved. One might expect that more senior professionals would have the wisdom of experience, network of personal contacts, time free from practice and financial resources to make substantial contributions to dentistry. The reasons that does not appear to be happening need to be investigated because of the potential loss of leadership capital this represents.

The differences between fellows of the ACD and the comparison group were in the expected direction. One of the criteria for selection into the college is demonstrated leadership potential. A larger proportion of ACD fellows reported participating in leadership, especially early in their careers, assumed high positions in larger constituencies and continued their involvement longer than did dentists generally. The fact

that roughly a quarter of ACD fellows listed no leadership participation in organized dentistry, dental education or research in dental fields reflects the fact that there are two sets of standards for fellowship. It has been traditional to accept some fellows based on a lifetime of service in one's community that brings respect to the profession. Those ACD fellows with relatively low reported leadership involvement tended to be older individuals.

The "inverted U" pattern for leadership is not unique to dentistry.

There was a high reported interest in increasing the number of young dentists in leadership positions and a willingness to mentor these professionals.

Researchers<sup>14</sup> have summarized several studies of the working population as a whole showing that occupational power and holding strong general opinions has the same trajectory across ages, as did leadership in this study. The peak of power in Eaton and colleagues studies in the general population peaked at about age 45 to 50 and had a ratio of maximum influence about four times as large as the minimally influential age cohorts had.

There is a potential that the design used in this study confounds career and secular trends in leadership patterns. The general decline in participation in organizations in America over the past half century has been well documented. **FIGURE 4** is a graphic representation of a sample of cases, including dentistry, drawn from the work of Robert Putnam.<sup>15</sup>

Although Putman tracked "membership" rather than "leadership," it is possible that the rate and level of leadership reported here will over-project future participation. It is also possible that positional leadership will be less attractive to new dentists compared with opportunities for project or steward leadership.

Although factor analysis suggested that leadership is regarded by dentists as a global construct, it was also found that the single most important characteristic expected of leaders in dentistry was epitomizing personal ethics and professionalism. It was significantly less likely that leadership would be associated with the need for making personal sacrifices, such as time.

There was a high reported interest in increasing the number of young dentists in leadership positions and a willingness to mentor these professionals. Practical mechanisms for fulfilling these wishes should be explored.

The focus of this research was on positional leadership only and a specific definition of leadership was offered to respondents with a view toward limiting the range of activities reported. This limitation was accepted in order to minimize the danger of collecting opinions heavily dependent of personal interpretations of a very protean concept. In future, we can hope that investigators will explore issues such as multiple dimensions in leadership, various leadership styles and the efficacy of a different approach. It is likely that diverse contexts will be a significant mediating factor.

Research involving trajectories over time presents a number of methodological challenges. Longitudinal studies are required to unambiguously disentangle developmental from secular trends, but studies that extend more than 60 years are of limited value for policy purposes.

There are alternative approaches to censoring across time categories, but the regression method used here appears defensible. There are also issues with comparing levels of leadership from committee member or project manager to president and across organizations of very different size and natural scope. The method of self-norming based on relative inverse frequencies used in this research is certainly not the only one that is possible, but it seems more defensible than arbitrary, respondent-generated methods or no corrections.

### Conclusion

This study represents the first report on the trajectory of positional leadership participation in a national sample of dentists. Both rate and participation weighted for level of responsibility and size of constituency were tracked. Early involvement in leadership was found to be predictive of later activity, with high and slightly rising rates beginning in dental school and continuing until about age 45 to 50. From that point, involvement in leadership declined significantly with age. Weighted participation reached its peak about five years later than rate of involvement, and fellows of the ACD showed an overall earlier, higher level and longer engagement in leadership.

It appears that there is significant interest and potential for early involvement of dentists in leadership positions. The phenomenon of mature dentists withdrawing from leadership 10 or more years prior to their retirement may represent a potential loss to the profession of a valued resource. Perhaps the “tournament” structure of dental leadership with its pyramid of formal positions could be expanded to include other leadership approaches, such as stewardship through mentoring,

charisma through spokesperson positions and transactional and transformational models involving greater participation by dentists in policy roles. ■

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**SIMI VALLEY (GP + Bldg for sale)** Great opportunity to invest in a general practice and real estate. Established in 1964, 4 equipped operatories, 2 plumbed not equipped. Net \$124K. **Property ID #5027.**

**SAN DIEGO COUNTY**

**EL CENTRO (GP)** — This practice is located in a single story building. **Building is for sale.** 5 equipped operatories. Projecting approx. \$335K for 2015. Buyer's net of \$86K. **Property ID #5023.**

**Oceanside (GP)** - Estab. In 1998 this practice is located in prof. med dent bldg. 5 ops.. Projecting approx. \$358K for 2015. **ID #5069.**

**POWAY**— GP w/ 20 yrs of gdwll. Has 2 eq ops & 1 plmbd not eq. Proj approx. \$188K for 2015. **ID #5084**

**San Diego** - GP located in a 3 story prof. bldg. 7 ops in a 2,980 sq ft suite. Proj. approx. \$1.9M for 2015. NET \$397K. **Property ID #5072.**

**RIVERSIDE & SAN BERNARDINO COUNTY**

**APPLE VALLEY** - 3 equipped operatories. Seller is working 4 days/wk and sees ~15-20 patients/mo. Monthly revenues of \$44K. Net of \$169K. **Property ID #5009.**

**CHINO**— Leasehold Improvement and Equipment + Condo. 4 chairs in open bay in single strip mall. This facility has been always at this location for 40 yrs. **Property ID #5076.**

**INDIAN WELLS (GP)** Modern designed practice with 4 equipped operatories in a 2,850 sq ft office. In shopping plaza. **Property ID #5041.**

**MURRIETA** - Well established general practice with 4 eq ops in a 2 story medical dental bldg. PPO & Cash only. BUYER'S NET OF \$156K. **Property ID #5061.**

**PALM DESERT**—Well established practice in a free standing bldg. This modern designed practice consists of 5 eq ops in a 2,350 sq ft office. 100% patient referral. Insurance and Cash only. Does 8 days of hygiene. NET OF \$306K. **Property ID #5058.**

**PALM SPRINGS** — General practice with 3 equipped ops located in a free standing bldg. Established in 2005. Suite is approx. 1,200. Seller work 5 days/wk. BUYER'S NET OF \$175K. **Property ID #4487.**

**RIVERSIDE**— GP + 2 Bldgs for sale - Established in 1996 this modern designed practice is located in a 2 story free standing bldg. Has 9 ops and 1 plmbd not eq. Projecting approx. \$867K for 2015. **ID #5085.**

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# Top Seven Data Breach Considerations

CDA Risk Management Staff

**D**ata breach news is ongoing and 2015 closed with no shortage of information about medical and dental record breaches.

The U.S. Department of Health and Human Services' (HHS) online listing of protected health information breaches, known as the "wall of shame," includes nearly 1,400 incidents of major data breaches (affecting 500 or more people) since 2009 when the HIPAA Breach Notification Rule began. One incident alone last year exposed the dental records of more than 151,000 patients to unauthorized users when an internal database was hacked at an Oregon-based dental services provider.

The Dentists Insurance Company receives numerous calls to its Risk Management Advice Line regarding data security, and analysts say dentists may not be aware of data security risks and the extent of notification required if a data breach occurs.

"Dentists can be unaware of their obligation to protect patient data and are astonished at how easily patient information can fall into the hands of unauthorized parties," said Sheila Davis, TDIC assistant vice president of claims and risk management.

A data breach is generally defined as an impermissible use or disclosure under the HIPAA Privacy Rule that compromises the security or privacy of patients' protected health information (PHI).

"The term data breach is often associated with someone hacking into your computers or website, but a data breach is when protected health information is in the possession of an unauthorized person or entity," Davis said.

The HIPAA Privacy Rule defines PHI as individually identifiable health

"A data breach is when protected health information is in the possession of an unauthorized person or entity."

information that is transmitted or maintained in electronic, oral or paper form. State laws address PHI and may vary from state to state. Examples of protected information include medical and dental records, defined as "any information regarding an individual's medical history, mental or physical condition, or medical treatment or diagnosis by a health care professional."

Also protected is personal information such as a person's first

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name or first initial and last name in combination with identifiers such as a Social Security number, driver's license number, account number, credit or debit card number, in combination with any required security code, access code or password that would allow access to the person's financial account. A username or email address, in combination with a password or security question and answer that would permit access to an online account, is also protected.

In the constantly changing digital environment, TDIC reminds dentists of the following data security considerations:

*Electronic theft:* Theft of computers, hard drives, portable devices and back-

up drives is the leading cause of data breach. The HHS Office for Civil Rights data breach portal indicates the type of breach and location of compromised information, and theft is by far the most common type of breach listed. Back-up drives and portable devices are especially vulnerable to theft.

"Data breach occurs when there is a theft of unencrypted patient data, either in the office or of portable equipment stolen in transit," Davis said. "There can be several thousand records involved."

TDIC can assist with breach claims for policyholders who purchase data compromise coverage as an addition to their commercial property policy. In one

recently closed case, TDIC covered the five-figure cost of determining the extent of patient data on a stolen mobile device, as well as the required patient notification and credit monitoring services.

*Notification:* Both federal and state laws require patient notification in the event of a data security breach. Regulations vary from state to state regarding data security breaches, but most states require notification of affected individuals. State attorneys general offices have state-specific information. For instance, in California, businesses are required to send consumers a letter if an unauthorized user has acquired their data. If letters are sent to more than 500 individuals, businesses must notify the attorney general's office.

"Dentists can be caught off guard regarding the extent of patient notification required when they become aware of a data breach," Davis said. "They may also believe that unless someone has attempted to access or use the information, they do not need to notify their patients."

"The problem is that once someone has attempted to access the information, then it's too late to try and take preventative measures," Davis added. "What could be viewed as careless security of patients' data compounded by a failure to notify the affected parties may have longstanding reputational damage for the practice."

*Notification expenses:* The cost of data breach notification is estimated at \$200 per individual, according to the Ponemon Institute, a research center focusing on data protection. This expense includes the cost of fines, mailings, published notification and credit monitoring services.

*Increasing regulation:* At least 32 states in 2015 introduced or considered security breach notification bills or resolutions, according to the National Conference of State Legislatures. This is in addition

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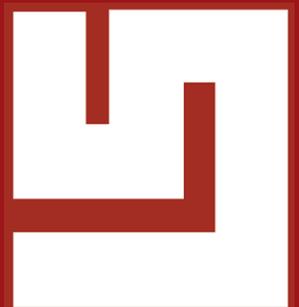
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to laws that impose monetary penalties upon individuals and institutions that fail to protect the privacy of patient medical records. With varying degrees of success, many of the newer bills sought to amend existing security breach laws to require entities to report breaches to attorneys general or another central state agency or expand the definition of “personal information” to include medical, insurance or biometric data in the event of a security breach.

California’s data breach notification law was amended to require changes, effective this month, to breach notification notices. New requirements include formatting, such as specified

headers and text no smaller than 10-point type, of the notice to call attention to the significance of the content.

Also in California, additional legislation defined “encryption” as “rendered unusable, unreadable or indecipherable to an unauthorized person through a security technology or methodology generally accepted in the field of information technology.”

Hawaii looked to expand the definition of “personal information,” establish a timeline in which a business must notify individuals affected by a security breach and prohibit use of email as a means of security breach notification if login credentials for email were compromised.

In Illinois, proposed legislation aimed to amend the Personal Protection Act, expand the scope of protected information to include medical, health insurance, biometric, consumer marketing and geolocation information and require notice of security breaches to be provided to the attorney general.

*Staff training:* Malware infection of office computers can cause data breach, and the entire dental team must use caution in accessing unfamiliar email, using the Internet and handling protected health information.

*Email security:* Given that many breaches occur when data travels outside the walls of your practice, it’s important to ensure that data can’t be compromised when travelling from point A to point B. HIPAA/HITECH regulations mandate that medical patient data being sent over the network must be encrypted.

If you send unsecured email with patient information, make sure to have the patient’s signed consent on file. TDIC has a patient release form on its website at [thedentists.com](http://thedentists.com) for this purpose.

*Encryption:* Analysts say encryption is the most effective way to minimize the damage that can occur from a breach of protected health information. Password protection of computers alone is not secure. If you are not sure if your office computers, back-up drives and portable devices are encrypted, chances are they are not. An experienced IT professional can help protect your data. Encrypting protected health information provides safe harbor under HIPAA’s data breach notification rule. ■

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**N. EAST OF SACRAMENTO:** 2,500 sq. ft., 7 Ops with intra-oral, Digital X-ray, and EagleSoft software. 2014 GR \$1.5M. #CA268 **IN ESCROW!**

**NORTHERN CALIFORNIA:** Endo Practice. 3 Ops, 1 Plumbed, 1,200 sq. ft. 2 Microscopes, Digital. 2013 GR \$319K+ #CA158

**NORTHERN CALIFORNIA:** Perio Practice, Partnership Position. 6 Ops, 1,500 sq. ft. Dentrix. Owner Financing Available. #CA168

**N. OF SACRAMENTO:** 1,750 sq. ft. w/4 Ops. Intra-Oral, Digital, Pano, Laser, CAD-CAM, Dentrix. 2014 GR \$1M. #CA260

**N. OF SACRAMENTO:** 1,324 sq. ft. office w/4 Ops, Dentrix, Pano. Owner worked 39 weeks in 2014. #CA267

**N. OF SACRAMENTO:** 1,800 sq. ft., 4 Ops, EagleSoft software, laser. 2014 GR \$289K. #CA307

**NORTH SACRAMENTO:** 3 Ops in a leased space with <1,000 sq. ft., PPO, 2 days Hygiene, Digital, Easy Dental. #CA266

**NORTH SACRAMENTO:** Practice & Condo. 2500 sq. ft., 5 Ops, Dexis Digital X-ray, Pano, Laser, Dentrix. 2014 GR \$673K. #CA305

**OAKLAND:** Appx. 1,500 sq. ft. w/4 Ops, Dentrix software, Dexis Digital X-ray. 2014 GR \$869K, adj. net \$370K. #CA293

**OROVILLE:** 1,000 sq. ft., Dentrix & Dentrix software, Digital Pan & X-rays, Laser, Intra-Oral. 2014 GR \$512K. #CA287

**OROVILLE:** 3 Ops, recently remodeled. Great satellite or startup practice. Owner retiring. #CA288

**PINOLE:** 4 Op Endo office w/Digital X-ray, Microscopes, and PBS Endo in approx. 1,200 sq. ft. 2014 GR \$672K. #CA284

**PLEASANTON:** Facility Only, Former Endo Ofc, Good GP Startup. 2 Ops, 1 Plumbed & Partially Eq. 975 sq. ft. #CA195

**ROSEVILLE/GRANITE BAY:** 1,320 sq. ft., 3 equip. Ops. 1 add'l Plumbed, Dexis Digital X-ray. 2014 GR \$434K. #CA296

**SACRAMENTO:** 1,684 sq. ft., 6 equip. stations in bay, 2 add'l Plumbed. 2014 GR \$590K. #CA269

**SACRAMENTO:** 2,500 sq. ft., 6 equip. Ops. 1 add'l Plumbed. Dentrix software, Digital X-ray, Pano. 2014 GR \$788K. #CA297

**SAN FRANCISCO:** Periodontal Practice & Condo Unit. 1,160 sq. ft. w/4 Op, 2014 GR \$714K w/\$363K adj. net. #CA274

**SAN RAMON:** Facility Only, 1654 sq. ft., 4 Ops. Pelton & Crane Equipment, Digital X-ray, Digital Pan, I.O. cameras. #CA306

**SANTA ROSA:** General Dentistry & Building. 3 Ops. 2013 GR \$542K w/Adj. Net \$182K. #CA200

**SONOMA:** Stand-alone 2,000 sq. ft. office w/4 Ops. Digital X-rays, Lasers, CAD/CAM. 2014 GR \$675K on 3 day/week. #CA270

**YOLO COUNTY:** Pediatric practice, 2 equip. Op, approx. 1,000 sq. ft., Intra-oral, Open Dental software. 2014 GR \$245K. #CA301

**CENTRAL CALIFORNIA**

**CALAVERAS COUNTY:** 4 Ops, 1,752 sq. ft., Dexis Digital X-ray, EagleSoft, Cerec, Pano. Av. GR last 3 years \$450K. #CA294

**CENTRAL COAST:** General Dentistry. 6 Ops, 8 days Hygiene/wk. GR over \$2M for last 3 yrs. Est. 30+ yrs. #CA208

**KINGS COUNTY:** General Dentistry, 4 Ops, Pano, established for 50+ yrs. GR of \$246K in 2014. #CA265

**MADERA:** Building & practice. 6 Ops, 3000 sq. ft., Dentrix software, Dexis software, Pano. 2014 GR \$850K. #CA289

**PORTERVILLE:** General Dentistry, 6 Ops. 2014 GR \$555K, 7 year old Equipment, retail center. #CA223

**SOUTHERN CALIFORNIA**

**ANAHEIM HILLS:** General Practice with 4 Ops, est. for 34 yrs. Dentrix, 6 days Hygiene per week. #CA279 **IN ESCROW!**

**BAKERSFIELD: NEW LISTING:** General Dentistry with 4 Ops, Dentrix, Dexis, Pano, PPO/FFS. 2014 GR \$329K #CA299

**BANNING:** General Practice. 6+ Ops. Paperless, Digital, EagleSoft. 8 Days Hyg/Week. 2014 GR \$1.4MM+. #CA183 **IN ESCROW!**

**BEVERLY HILLS:** Small boutique practice, 2 Ops, 1 Equipped, Open Dental, Digital, 2014 GR \$120K on 3 days/wk.. #CA215

**CARSON:** 3 Op General Practice. Paperless, EagleSoft, Digital, Pano. All equip. <3 yrs. old. 2014 GR \$143K. #CA280

**CYPRESS:** General Practice, 5 Ops, 35 yrs. of Goodwill. 7 days Hygiene per week. \$948K GR. #CA257 **IN ESCROW!**

**GREATER LOS ANGELES:** Perio Practice, 5 Ops, 34 Yrs. of Goodwill. Dentrix, Digital, Laser, great referral base. #CA173

**HACIENDA HEIGHTS:** General Dentistry, 5 Ops, 3 Equipped, retail center, Digital, Pano. PPO. #CA295

**HUNTINGTON BEACH:** 5 Ops, 28 yrs. of Goodwill, Digital, Pano, Laser, 12 days of hyg./wk. GR of \$1.1MM+. #CA263

**INLAND EMPIRE:** Endo Practice. 4 Ops, 3 yr. new equip., Digital, Cone Beam CT. 2014 GR \$739K with low overhead. #CA281

**INLAND EMPIRE:** General Practice 7 Ops, Dentrix, Digital, Pano, 30 yrs. goodwill. 4 1/2 days of Hygiene. #CA283

**INLAND EMPIRE:** General Dentistry, 4 Ops, Camera, Digital, Pano, 2014 GR \$534K, Adj. Net 4196K. #CA285

**LAGUNA BEACH: NEW LISTING!** General Dentistry, 5 Ops, 3 Equipped. Great Location. 2014 GR \$503K. #CA303

**LOS ANGELES:** General Dentistry, 6 Ops, 5 Equipped, Est. 50+ yrs., SoftDent, Digital. 2014 GR \$591K. #CA255 **IN ESCROW!**

**PALM DESERT:** General Practice, 5 Ops, Est. for 32 yrs., 6 days of Hygiene/week/GR of \$824K and \$339K adj. net. #CA245 **IN ESCROW!**

**PASADENA AREA:** General Dentistry, 3 Ops, Dentrix, Dexis, CEREC, established for 50+ yrs. #CA282

**PICO RIVERA:** General Dentistry, 6 Ops, Est. in 1960. DentiSoft, Pano, 4 1/2 days of Hygiene per week. 2014 GR of \$690K. #CA258 **IN ESCROW!**

**S. ORANGE COUNTY:** Pedit Practice with 4 Ops, 1 year new Equipment, Digital, Pano/ \$236K GR with room to grow. #CA222

**SANTA BARBARA: NEW LISTING!** General Dentistry. 4 Ops, est for 40+ years. 8 days Hygiene/week, long-term staff. FFS. GR of \$827K. #CA291

**SOUTH PASADENA:** General Dentistry. 4 Ops, 3 Equipped, paperless, Digital, est. 37 yrs. 2014 GR \$856K with \$271K adj. net. #CA244 **IN ESCROW!**

**VICTORVILLE:** General Practice. 3 Ops, 3 Plumbed, 2,150 sq. ft. Est. 34 yrs., SoftDent. 2014 GR \$273K. #CA149

**WEST HOLLYWOOD:** General Practice, 4 Ops, Intra-Oral Camera, Digital, Laser, 5 yr. old equip. 2014 GR of \$613K. #CA212 **IN ESCROW!**

**WHITTIER:** General Dentistry. 4 Ops, 3 Equipped. Dentrix, Dexis. Est for 50+ yrs. on main street. 2014 GR \$217K. #CA276

**SAN DIEGO**

**CHULA VISTA:** General Practice, est. 50+ yrs. 4 Ops, 3 1/2 days of Hygiene, Dentrix. \$493K GR in 2013. #CA109

**CHULA VISTA EAST: NEW LISTING!** General Dentistry. 3 Ops. Est. 19 years. Professional bldg. 2014 GR \$454K. #CA304

**COLLEGE AREA, SAN DIEGO:** Very busy 6 Op General Practice with room to expand to 9 Ops. PPO, Dentrix, Digital. 2014 GR 1.7M. #CA231

**DOWNTOWN:** Leasehold sale. Modern and chic downtown office in prime location. 3 Ops + room to expand. #CA232

**ESCONDIDO: NEW LISTING!** 4 Ops, 3 Chairs, Central Escondido, Doctor Retiring. Excellent Opportunity to merge/grow. #CA292

**LA JOLLA:** General Practice, 3 Ops, FFS and Delta Premier. 2014 GR of \$559K. Owner retiring. #CA278

**NORTH COUNTY INLAND:** General Dentistry, 6 Ops, FFS/PPO. Free-standing bldg. also available to buy. #CA271 **IN ESCROW!**

**S. BAY AREA, SAN DIEGO:** General Dentistry, 3 Ops, 4 days hyg/wk. Retail center, Dentrix, Digital Pano, PPO & FFS. GR 2014 \$524K. #CA206 **IN ESCROW!**

**OUT OF CALIFORNIA**

**MAUI, HAWAII: NEW LISTING!** General Practice, 7 Ops, 5 Equipped, Modern Design, CEREC. 2014 GR \$1.4MM+. #HI101

**CENTRAL OAHU, HAWAII: NEW LISTING!** General Dentistry. 3 Ops in Central Oahu. Dentrix, Dexis, Pano. 2014 GR \$454K #HI102

**HONOLULU, HAWAII: NEW LISTING!** General Practice, 3 Ops, Dentrix, Digital, FFS/PPO. #HI100

# HIPAA Security Rule Technical Safeguards

CDA Practice Support

Many dental practices utilize third-party IT service providers to assist them in complying with the HIPAA Security Rule technical safeguards. However, some practices are uncertain whether the IT services being provided are actually required by HIPAA. This article reviews the HIPAA Security Rule technical safeguards, both the required and the addressable safeguards. A covered entity must implement an addressable safeguard if, after it conducts its risk analysis, the covered entity deems the safeguard to be reasonable, appropriate and applicable.

A technical safeguard is the technology that protects and controls access to electronic protected health information (ePHI), as well as a covered entity's policy and procedures on the use of that technology. HIPAA is technology neutral, that is, the law does not require the use of specific technology, such as data back-ups in the cloud versus encrypted flash drives. A covered entity should choose technology that integrates with its information system and achieves the necessary safeguard. In addition, HIPAA allows a covered entity to consider its size when considering the implementation of a safeguard. For example, magnetic key cards used in many large health facilities to control physical access is one type of safeguard that a small dental practice would not need to implement because of it has few employees and is in a much smaller space.

## Required Safeguards

*Unique user identification:* Each individual who has access to a covered entity's information system must have a unique identifier, either a name or number, to allow the tracking of that individual's activity on the system. The unique identifier typically is assigned by the system administrator to an individual, and the unique

identifier is combined with a method of "person or entity authentication" to allow access to the covered entity's information system. The technology used in most offices is the login process of the electronic health record (EHR)/practice management software. The associated policy that a covered entity should have is that no one shares his or her login information with others.

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**ARCADIA** – (4) op comput G.P. Located in a well known Prof. Bldg. on a main thoroughfare. Cash/Ins/PPO pt base. Annual Gross Collect \$300K+ on a (3) day week.

**BAKERSFIELD #29** - (4) op comput G.P. (3) ops eqt'd, (1) add. plumbed. Located in a free stand bldg. Cash/Ins/PPO. Digital x-rays. Annual Gross Collect \$300K+ p.t. Seller moving.

**BAKERSFIELD #31** - Free Stand. Bldg. & Pract. (4) op comput G.P. w excell. exposure & signage. (3) ops eqt./4<sup>th</sup> plumbed. Annual Gross Collect \$325K+ Cash/Ins/PPO. **NEW**

**CAMARILLO** – (3) op comput. G.P. 2 eqt'd./3rd has a Pano. Cash/PPO. \$120K Gross p.t. **NEW**

**GROVER BEACH** - (3) op Turnkey Office w included charts (included, but not guaranteed). (2) ops eqt'd w newer eqt. 3<sup>rd</sup> plmbd. Networked, digital Pano & x-ray. Dentrux. In a strip ctr. **NEW**

**MONTEBELLO** - (4) comput G.P. (2) ops eqt'd. Located in a busy shop. ctr. w exposure & visibility. Annual Gross Collect. \$200K on a p.t. schedule. Cash/Ins/PPO. Seller retiring. **NEW**

**MONTEREY PARK** – (6) op comput G.P. located in a street front suite on a main thoroughfare w exposure/visibility. Cash/Ins/PPO/Small % Denti-Cal. Gross Collect \$250K+ p.t. **REDUCED**

**OXNARD** – (4) op comput. G.P. in a prof. bldg. 2014 Gross Collect \$264K+ on (3) days. Digital x-rays. Dentrux. Cash/Ins/PPO/HMO/Denti-Cal. Refers diff Endo/O.S./Perio & Ortho. **NEW**

**RANCHO CUCAMONGA** - (4) op comput. G.P. in a shopping ctr. w excellent exposure, visibility, signage & parking. Collect \$590K+ in last 12 mos. Cash/Ins/PPO/Denti-Cal pts. Modern eqt. & digital x-rays. Low Overhead. Seller retiring. **SOLD**

**SANTA BARBARA COUNTY** – (3) op comput G.P. & a 1,900 sq ft Bldg. that houses the practice & a residential unit that can be rented or lived in. "Fee for Service." No PPO, HMO or Denti-Cal. 2015 Projected Gross Collections \$275K+ on a relaxed 3½ day week. Seller refers all O.S., Perio, Ortho, Endo & implant placement. Seller retiring but will assist w transition. **NEW**

**SHERMAN OAKS** – (3) op comput G.P. in a well known Med/Dental bldg. "Fee for Service." Annual Gross Collect \$160K+ p.t. Great Starter or Satellite. Seller retiring. **REDUCED**

**So. KERN COUNTY** – (6) op comput. G.P. located in a Bakersfield suburb in a small strip ctr. w exposure/visibility. Pano eqt'd. Limited competition. Cash/Ins/PPO pts. Annual Gross Collect. Approx. \$350K p.t. Seller is moving and is motivated. **REDUCED**

**SAN FERNANDO VALLEY** - (8) op comput. G.P. w modern equipt. Located in a prof. bldg. on a main thoroughfare. Cash/Ins/PPO/HMO. Cap Ck approx \$7K/mos. Collect \$1.3M+/yr. **NEW**

**SANTA ANA** - absentee owned (6) op fully eqt'd G.P. First floor street front location on a main thoroughfare. Exposure/visibility/signage. Cash/Ins/PPO. No HMO & No Denti-Cal. Pano eqt'd & Computerized. 2014 Gross Collect. of \$526K+ on a (3½) to (4) day Associate run week.

**TUSTIN** - (4) op comput. G.P. (3) ops eqt'd/4<sup>th</sup> plumbed. Located in a busy shop ctr. on a main thoroughfare. Excellent exposure, visibility, signage & parking. Digital x-rays. "Turnkey Office" w some pt. charts included but not guaranteed. **PENDING**

**THOUSAND OAKS** (4) ops/(2) eqt'd comput. Turnkey Office with included charts. Chart included but not guaranteed. Located in a Prof. Bldg. on a main thoroughfare. **NEW**

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*Emergency access procedure:* A covered entity must have procedures in place to allow for the retrieval of ePHI during or following an emergency. An emergency can be anything from a loss of electrical power in the neighborhood to the building burning down. When developing the procedures, a covered entity should consider the type and duration of an emergency, which workforce members need access to the ePHI and new or additional technology or services to ensure access.

*Audit controls:* A covered entity must implement hardware, software and/or procedural mechanisms that record and examine activity in information systems that store and/or use ePHI. Consider what data to collect and processes to review, how often audit records should be reviewed, what is a reasonable level of auditing for the size of the covered entity and is the information collected sufficient for the covered entity to adequately review information system activity.

*Person or entity authentication:* A covered entity must implement procedures to verify that a person or entity seeking access to ePHI is the one claimed. The typical authentication method is a password or PIN. Other methods include a physical item such as a smart card or key, or a biometric such as a fingerprint. The associated policy that a covered entity should have is that no one shares his or her login information with others.

Notice how this HIPAA requirement allows a dental practice that uses an EHR to comply with the Data Protection Act (DPA) requirement to sign treatment entries. The use of a unique user identifier combined with a person authentication method can verify that a specific user electronically signed a treatment

CONTINUES ON 58



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#### 4085 SANTA ROSA GP & BUILDING

Practice and real estate offered for sale in well-established condominumized medical/dental complex conveniently located near Memorial Hospital. Tastefully decorated with a homey décor, practice occupies 1,200 sq. ft. ~ 3 fully equipped ops, private office, staff lounge, etc. Seller is retiring after almost 20 years but will assist for a smooth transition. Average Gross Receipts \$256K with adj. net of approx \$110K. Asking price \$160K for the practice, and \$270K for the real estate.

#### 4084 SAN BRUNO GP

2014 Gross Receipts \$279K. Convenient, spacious design, 5 op & private office. Asking \$175K.

#### 4010 SF GP

State-of-the-art, modern dental practice in gorgeous facility with recently upgraded reception, business and private office in approx. 3,200 sq. ft. office with 6 fully equipped ops. Located close to downtown. Assignable lease with options to renew. Equipment includes inter-oral camera, laser, digital x-ray, air abrasive, Omnicam, Cerec, and implant system. 2014 Gross Receipts over \$1.3 Million. 2015 on schedule for \$1.6 Million. Asking \$1.1 Million.

#### 4089 SUNNYVALE GP

Extremely desirable location on the corner of two well known/major cross streets with easy freeway access. Beautifully appointed practice with 5 plumbed, 4 fully equipped ops. Lots of natural light and a park like setting. Seller is offering 12 years of goodwill and approx 500 active patients. Average gross receipts (last 3 years) \$328K with an adjusted average net of \$122K. Seller will help for a smooth transition. Asking price \$250K.

#### 4071 SAN MATEO GP

Well-est. GP in single story professional dental building located on a heavily traveled main artery between downtown San Mateo and downtown Burlingame. 4 fully-equipped ops in modern office w/digital x-ray, inter-oral camera, laser & Cerec. Asking \$459K.

#### 4081 HAYWARD GP

Seller retiring from successful GP with well-trained, seasoned staff. 4 fully-equipped ops. in seller owned building. Practice generates over \$1M/year. All fee-for-service. Asking price for practice only \$732K. Building is also available for purchase.

#### 4086 SILICON VALLEY PERIO

Well-established Perio practice in prime San Jose location with referral sources nearby. Located in a commercial & residential mix neighborhood with a large daytime business draw. Approx. 1,100 sq. ft. office with 4 fully-equipped ops. Well trained dedicated staff, seller retiring and willing to help for smooth transition. 2014 GR \$482K+, 2015 on schedule for \$539K+ as of August. Asking \$295K.

#### 4069 SOUTH BAY PERIO

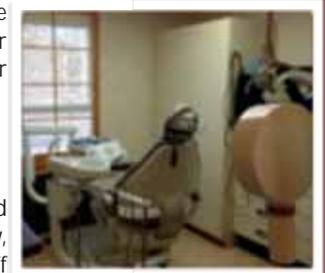
Well established Perio practice in desirable South Bay location. Approx. 1,700 sq. ft. facility w/4 fully-equipped ops in a professional dental building. 2014 GR \$500K+. 3 doctor days per week. Practice sees 30-40 new pts. per month. Cone beam scanner & panoramic x-ray purchased recently. Seller willing to help in the transition. Asking \$460K.

#### 4088 NEWARK/FREMONT DENTAL FACILITY

1,400 sq. ft. facility with 4 fully-equipped operatories setup for right-handed delivery, reception area, private office, consult room, staff lounge, lab area, sterilization area, storage area, 2 bathrooms, common area and plenty of parking. Located in mall close to new housing. Lease expires in 3 years with 5 year option to renew. Landlord willing to negotiate new 10 year lease at a fair market rate. Equipment list available. Asking \$80K.

#### SF DENTAL FACILITY

Facility only in the Sunset district, located on Ocean Avenue. 2 fully equipped ops with room for a 3rd op. Asking price \$85K. Lease is transferable to Buyer.



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CONTINUED FROM 56

entry on a specific date and time. Dental practices should not allow staff to sign in for each other, and the lack of a clear policy or failure to sanction employees for failing to follow this policy can raise doubt about the veracity of the dental record.

**Transmission security:** A covered entity must implement measures to prevent unauthorized access to ePHI being transmitted over an electronic communications network. There are two primary measures that can be implemented, and both are addressable safeguards. If a covered entity cannot implement a transmission security measure, then it should not transmit ePHI electronically.

**Integrity controls:** Secure network communications protocols are a primary method for protecting ePHI being transmitted. For example, when a dental practice uploads claims to a claims clearinghouse website or directly to a dental benefit plan website, the practice logs into a secure website. A secure website can be identified by the letters “https” that precede the website address. Some secure websites include the image of a lock on the web address field. Some institutions, banks for example, may have one or two additional layers of security such as a security question or texting a PIN to enter on its website.

**Encryption:** Encryption is a recognized method of securing electronic data to be transmitted over an open network (not a secure network). There are several methods of encryption and decryption available today. Some factors that a covered entity should consider when considering an encryption method are email attachment size, the recipient’s capability to decrypt data and ease of use.

### Addressable Safeguards

An addressable safeguard must be implemented if a covered entity, after performing a risk analysis, has determined it is reasonable and appropriate for the covered entity to do so.

**Automatic logoff:** A covered entity can require staff to log off when not using the information system, but there may be times when someone forgets to do so or gets distracted with other work and fails to do so. Automatic log off is an electronic procedure that terminates a user’s session on the system after a predetermined time of inactivity. Most operating systems allow the activation of a screen saver after a period of inactivity, and a password must be used to clear the screen. Some software applications may also allow automatic log off to be set.

**Encryption and decryption:** Encryption is a recognized method of securing electronic data by encoding it, and decryption decodes the data using a “key.” Several methods exist to encrypt stored data. Some questions a covered entity can consider when selecting an encryption method are what data should be encrypted, can the method encrypt both data “at rest” and “in motion” or should you have a different solution for each and how does the encryption method impact other system processes such as automatic data back-ups and data processing speed.

**Mechanism to authenticate ePHI:** Some information systems have functions or processes that automatically check for data integrity, that is to verify that ePHI has not been altered or destroyed in an unauthorized manner. A covered entity in its risk analysis should identify which of its information, if compromised, would pose a significant risk, then determine

what type of mechanism, such as software, is reasonable and appropriate to authenticate that the ePHI has not been altered or destroyed. ■

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TMD/TMJ

## Interventions for TMJ

Manfredini D. No significant differences between conservative interventions and surgical interventions for TMJ disc displacement without reduction. *Evid Based Dent* 2014 Sep; 15(3):90-1. doi: 10.1038/sj.ebd.6401049.

**Purpose:** This is a review comparing controlled studies concerned with treatments for TMD. These studies are expected to be at the top of the evidenced-based pyramid in reliability. Deciding on any treatment is critical and difficult for TMD patients. The author compared studies where patients were treated in conservative manners and studies where surgery was deemed appropriate.

**Materials and methods:** This was a review of random or quasi-random controlled trials involving patients with clinical and/or radiological diagnosis of acute or chronic disc displacement without reduction (DDwoR), in cases where patients underwent any form of conservative or surgical treatments. The main outcomes were pain intensity of the TMJ and active, unassisted, maximum mouth opening (MMO). The Cochrane Central Register of Controlled Trials (CENTRAL), Medline, Embase and Scopus databases were searched.

**Results:** Twenty studies were involved, which included 1,305 patients. However, 12 studies were considered to have "high risk" of bias. Eight studies had unclear risk of bias. Of the interventions, 21 comparisons were made. Meta-analyses were carried out for four comparisons. There were no statistically significant differences between interventions relative to primary outcomes at short- or long-term follow-up for most of the comparisons.

**Clinical relevance:** The author feels more invasive treatment should only be done with "objective clinical need." The application for the clinician is determining whether it is in the patient's best interest to provide minimal conservative treatment and face the patient continuing in pain for a longer period, or to do something more invasive as determined by evaluation and the clinician's knowledge and experience.

– Daniel N. Jenkins, DDS, CDE

MICROBIOLOGY

## Presence of *S. aureus* and MRSA in the oral cavity

Koukos G, Sakellari D, Arsenakis M, Tsalikis L, Slini T, Konstantinidis A. Prevalence of *Staphylococcus aureus* and methicillin resistant *Staphylococcus aureus* (MRSA) in the oral cavity. *Arch Oral Biol* 2015, 60 (9): 1410-5.

**Background:** *Staphylococcus aureus* is known to cause infectious diseases in the maxillofacial complex. However, its prevalence in the oral cavity as well as association with periodontal diseases has not been well documented. Methicillin resistant *S. aureus* (MRSA) has a large impact on global health issue because MRSA infections occur in people who have been in hospitals or other health care settings. Therefore, it is possible that MRSA spreads from infected dental practitioner to patients and vice versa. The purpose of the study was to determine the presence of *S. aureus* and MRSA in the oral cavity.

**Methods:** One hundred and fifty-four systemically healthy subjects with periodontal health, gingivitis or chronic periodontitis were assessed for the prevalence of *S. aureus* and MRSA in the oral cavity. Samples collected from the first molars, the tongue and deep periodontal pockets were analyzed by polymerase chain reaction (PCR) for the presence of *nuc* (an *S. aureus* encoding gene) and *mecA* (a MRSA encoding gene). Nonparametric tests, including Kruskal-Wallis tests for clinical parameters and z-tests with Bonferroni corrections for distribution were performed for statistical analyses.

**Results:** *S. aureus* was detected in 18 percent of all subjects, however, no statistically significant differences were observed among groups or within the same group. In addition, the *mecA* gene was not identified in any of the *S. aureus* found. No MRSA was isolated from the oral environment of any of the test subjects (determined by the absence of the *mecA* gene).

**Conclusions:** *S. aureus* appears to be present in the oral cavity regardless of periodontal status, and therefore does not play a major role in the pathogenesis of periodontal diseases. MRSA is unlikely colonizer of the oral cavity, and therefore, it is unlikely to spread from dental practitioners to patients.

– Jennifer Cheung, BS, and Takahiro Chino, DDS, MSD, PhD

## PERIODONTICS

## Chronic periodontitis treatment

Newkirk S, Slim L, Cobb CM. Laser-Assisted New Attachment Procedure (LANAP): Strength of Evidence. *J West Soc Periodontol Periodontol Abstr* 63:3-7, 2015.

**Clinical problem:** When faced with new clinical protocols or procedures, clinicians should weigh the strength of scientific evidence prior to their application in patient therapy. Millennium Dental Technologies Inc. (MDT) was formed to market the PerioLase dental laser, a 6 watt FR (Free Running) Nd:YAG (Neodymium: Yttrium Aluminum Garnet) laser specifically designed for the laser-assisted new attachment procedure (LANAPTM) protocol. The LANAPTM protocol is promoted as a surgical therapy for the treatment of periodontitis through regeneration of the periodontium and is based on a comprehensive multistep protocol.

**Aim:** To evaluate the existing peer-reviewed evidence for using the LANAPTM protocol in the treatment of chronic periodontitis.

**Method:** The authors evaluated research articles published in peer-review journals that report clinical results following application of the LANAPTM protocol in treatment of chronic periodontitis. Factors such as clinician masking, calibration, sponsor or source of funding for individual studies, relationship of authors to MDT and methods of procurement of clinical parameters were considered in the evaluation.

**Results:** A total of 24 papers have been published since 1994; six (25 percent) in peer reviewed journals and the remaining 18 (75 percent) published in marginally or nonpeer reviewed journals. Of further interest is that 11 (46 percent) articles can be classified as opinion articles; 8 (33 percent) can be classified as research articles; 5 (21 percent) are uncontrolled case reports; 14 (58 percent) were authored or coauthored by officers of MDT; and 10 (42 percent) of the articles have been published in *Dentistry Today* which has an officer of MDT on the editorial board.

The best-designed and controlled study was published in 2014 in a marginally peer-reviewed journal, *Proceedings of SPIE*. This study used masked and calibrated clinicians. Fifty-one subjects were entered into a multicenter randomized, controlled, longitudinal human clinical trial. Following randomization of quadrants in each subject, the following treatments were provided: supragingival debridement (control), scaling and root planing (SRP) alone, modified Widman flap surgery (MWF) and LANAPTM. At 12 months post-treatment, there were no statistically significant differences in pocket depth or bleeding on probing among the SRP, MWF and LANAP results. The one significant finding in this trial was that patients found the LANAPTM procedure to result in less discomfort than the MWF.

**Conclusions:** Collectively, a review and evaluation of the publications classified as research articles showed a high risk of bias and the strength of the limited evidence was judged to be weak.

**Bottom line:** If only peer-review evidence is considered, clinicians should be cognizant of the fact that LANAPTM for treatment of chronic periodontitis appears to be equivalent to traditional MWF surgery and only slightly better than SRP.

– Charles M. Cobb, DDS, MS, PhD, Gerald I. Drury MS, DDS

## DENTAL MATERIALS

## High-viscosity glass ionomer

Hilgert LA, de Amorim RG, Leal SC, Mulder J, Creugers NH, Frencken JE. Is high-viscosity glass-ionomer cement a successor to amalgam for treating primary molars? *Dent Mater* 2014 Oct;30(10):1172-8.

**Purpose:** This study is aimed to assess and compare the cumulative survival rate of amalgam and atraumatic restorative treatment (ART) restorations in primary molars over three years.

**Methods:** Two hundred and eighty children aged 6 to 7 years old from a suburban area of Brasilia in Brazil were enrolled in a cluster randomized controlled clinical trial using a parallel group design covering two treatment groups: conventional restorative treatment with amalgam (CRT) and atraumatic restorative treatment (ART) using a high-viscosity glass-ionomer (HVGIC) Ketac Molar Easymix. Three pedodontists placed 750 restorations (364 amalgam and 386 ART in 126 and 154 children, respectively) which were evaluated at 6 months, one, two and three years.

**Results:** The cumulative survival rates over three years for all, single- and multiple-surface CRT/amalgam restorations (72.6 percent, 93.4 percent, 64.7 percent, respectively) were no different from those of comparable ART/HVGIC restorations (66.8 percent; 90.1 percent and 56.4 percent, respectively) ( $p = 0.10$ ). Single-surface restorations had higher survival rates than multiple-surface restorations for the both treatment procedures ( $p < 0.0001$ ). A higher proportion of restorations failed because of mechanical reasons (94.8 percent) than of secondary caries (5.2 percent). No difference in reasons for restoration failures between all types of amalgam and ART/HVGIC restorations were observed ( $p = 0.24$ ).

**Discussion:** Several improvements have been applied to glass ionomers – coating the outer surface, modifying its composition, which showed the encapsulated high-viscosity glass ionomers have significantly higher mechanical strength values than conventional high-viscosity glass ionomers and applying heat from a high-intensity LED curing light. This thermal-curing aspect needs to be investigated further.

**Clinical implications:** In the search for alternatives for amalgam, the high-viscosity glass ionomer used in this study in conjunction with the ART is a viable option for restoring carious dentin lesions in single surfaces in vital primary molars.

– Karen Schulze, DDS, PhD



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**6095 WEST CONTRA COSTA COUNTY'S PINOLE** Located off Interstate 80 in Dental Village alongside Appian Way. 3-days of Hygiene. 2015 tracking \$425,000 in collections. Delivery systems in ops were upgraded 11-years ago.

**6094 PERIO PRACTICE - SAN FRANCISCO BAY AREA**  
 This offering shall appeal to the Periodontist who wants a high-end practice in a desirable area. 2015 is trending \$700,000 in Available Profits.

**6093 CENTRAL MARIN COUNTY** Located in hub of Marin County. Consistent \$700,000+ per year performer with strong Profits. 3-days of hygiene. Digital office.

**6092 ROSEVILLE** 2015 trending \$350,000. 3-ops with 4th available. Convenient location on Douglas Boulevard. End cap suite in strip center with fantastic exposure.

**6091 MODESTO** 3-day per week practice collected \$450,000 in 2014. 3-days of Hygiene. Great rent of \$2,085 for 1,763 sq.ft. 5-op suite. Centrally located off Briggsmore Avenue. Hands-on Successor shall do very well here.

**6089 MOUNT SHASTA** Small town living renowned for outdoor living. Perfect escape from Rat Race and corporate intrusion. On 3-day week, 2015 trending \$850,000 with \$450,000 in Profits.

**6088 SANTA CRUZ** Well established, lots of patients. Strong Hygiene Department with 3.5 days of hygiene per week. Collected \$600,000 in 2014. 2015 trending \$675,000+.

**6087 LAKE TAHOE - NEVADA'S STATELINE**  
 "Fee-for-Service" as practice is "out-of-network" with insurance companies. Collections last year topped \$600,000 with Profits of \$220,000. 3.5 days of hygiene per week. Nevada State Board of Dental Examiners accepts the Western Boards.

**6081 SANTA CLARA** El Camino Real location. 2015 tracking \$775,000 with Profits of \$325,000. Management is on "cruise control." New Doc who is ambitious and extends hours shall push practice over the \$1 Million bar very quickly. 5-ops in 1,700 sq.ft.

**6080 SAN RAMON** 8+ days of Hygiene per week. \$450,000 invested in 6-Op office. Collected \$900,000+ per year performer. Attractive transition arrangements available.

**6071 CHICO** Strength is 4-day Hygiene schedule. Retiring DDS focuses on restorative. Endo, Perio & Pedo referred. 2014 collected \$450,000. Beautiful 4-Op office. Full Price \$150,000.

**6070 VISALIA** Strong foundation and well-positioned for successor. Strong Hygiene Department, beautiful facility, well equipped. Digital throughout. Not a Delta Premiere practice. Revenues trending \$750,000 for 2015 on part-time schedule. Extend hours and be busier. Best location!

**ARROWHEAD** Absentee Owner. Grosses \$450,000. Hi Identity Lake Drive Building. Practice \$350,000. RE \$250,000.

**DANA POINT** Grossed \$950K in 2013 with ortho. No longer doing ortho. Absentee Owner. Full price \$650,000

**EAST LOS ANGELES - EMERGENCY SALE** Huge Latino population within 3 radial miles. Long established. Million Dollar Potential Hi Identity office. Full Price \$330,000.

**GRANADA HILLS** Location. Seeks Specialists.

**HEMET** Grosses \$850,000 with opportunity to increase substantially. Seller will work back as will associates. Great opportunity for Oral Surgeon or Corporate Group.

**INDIO DENTAL OFFICE** Next to City Hall. 2 ops in 4,000 sq.ft. hi identity building includes real estate. Asking \$650,000. Make Offer.

**IRVINE** Great location. Busy Lady DDS will Solo Group her 5 ops or partner into acquiring building with Specialists.

**LOS ANGELES HMO** Grossing \$4 Million. In Escrow. Back-Up Offers requested.

**MISSION VIEJO** Freeway location. Solo Group. New DDS with patients will be paid 40%. Join Million Dollar state-of-art office. Membership \$30,000.

**NORCO - CORONA** Recently renovated. Gorgeous 8 ops and digital includes cone beam. Grossing near \$100K/month. Hi identity building approx 3,000 sq.ft. Great for Absentee Buyer or Specialist as Seller will work back on contract. Full Price for practice \$1.1 Million and Building \$900,000.

**REDLANDS** Full Price \$50,000 Established 27 years. Connect with 3,000 employee Employer. Rent \$850/mth year one, \$1,250/mth next 5-years and then \$1,450/mth 5 more years.

**REDLANDS** 5 Ops and digital. Rent \$2,400. 900 Patients. Absentee Owner. Full Price \$250,000

**RIVERSIDE** Divorce Sale. Full Price \$31,000 includes 4 ops in historic professional location. Includes all charts seen prior to 2014. Rent negotiable.

**SAN FERNANDO VALLEY** Grossed \$550,000 in 2014. Will do \$650,000 in 2015. Full Price \$550,000.

**SAN FERNANDO VALLEY** Long established. Renovated in 2010 at cost of \$350,000+. Gorgeous 2,000 sq.ft. 6 ops. Digital includes Panorex. Full Price \$500,000.

**TUSTIN BUILDING** 2,000 sq.ft. available at best intersection. 60,000 autos pass daily.

**TUSTIN DENTAL BUILDING** 5 ops in 1,875 sq.ft. office in Tustin Hills. \$1.4 Million.

**VALENCIA - SANTA CLARITA** 60,000-to-70,000 autos pass this intersection daily. 8 ops plumbed, 4 equipped. 2,000 sq.ft. Full Price \$220,000.

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## BAY AREA

**AC-335 SAN FRANCISCO:** Great Practice! 2100 sf, 8ops in desirable location. Call for Details \$475k!

**AG-511 SAN FRANCISCO:** Trendy, tony West Portal neighborhood. 800+ sf w 3 ops \$315k

**AN-490 SAN FRANCISCO:** *This is an opportunity of a lifetime!* 1,000 sf w/ 4 ops. \$795k

**BN-183 HAYWARD:** *Kick it up a notch by increasing the current very relaxed work schedule!* 1,300 sf w/ 3 ops \$150k

**BN-279 CONTRA COSTA COUNTY:** Excellent Merger Opportunity! 2-story. 1,350 sf w/ 3 ops +1 add'l \$60k

**BC-361 OAKLAND:** Established for over 23+ years! 2,200 sf w/ 7 ops. **Now Only: \$330k**

**BC-381 PLEASANT HILL Facility:** Open Floor Plan! 1,852 sf w/ 6 equipped ops! \$80k

**BC-509 SAN LEANDRO:** Facility Only, 800 sf, 3ops w/ xray in each op. Call for Details \$60k

**BG-407 SAN LEANDRO:** Prof bldg. Great signage! 1200 sf w/ 3 ops \$125k

**BN-426 BERKELEY:** Step into this quality practice and you'll know you belong here! 1,384 sf w/ 3 ops. \$495k

**BC-432 PITTSBURG:** Own this family-oriented Practice! 1,640 sf w/ 6 ops. \$350k

**BC-487 MARTINEZ Facility:** Martinez/Pleasant Hill Border, Great for Specialist, 1750sf. 1op +5 add'l plumbed \$60k

**BN-463 FREMONT:** Gross Revenues Exceeded \$590k in 2014 on 4 day work week! 1,720sf w/ 3op + 4 add'l. **Now Only \$435k!**

**BN-504 RICHMOND:** Established Practice and Real Estate! 1,450 sf w/ 2 ops + 2 add'l \$100k /RE \$700k

**CC-456 SOLANO COUNTY:** Highly visible! 2,997 sf w/ 6 Dr ops + 2 Hyg ops +1 add'l \$850k

**CN-482 SANTA ROSA:** Rare Opportunity in highly desirable area. 1050 sf w 3 ops \$150k

**DC-476 DUBLIN:** Shared Facility. Great for Specialist - Endo, Peds or Ortho. 1100 sf w/ 2 ops+1 add'l \$125k

## BAY AREA CONTINUED

**DC-406 SAN JOSE:** Amazing opportunity in Westgate Shopping Center. 6 ops + 80 mall hours per week \$400k

**DG-499 SARATOGA Facility:** 2 fully equipped ops & room for 1 add'l w 1,178sf . Move-In Ready \$150k

**DN-447 SUNNYVALE:** Quality, family-oriented opportunity awaits your talent and skill. 1,200 sf w/ 3 ops + 1 add'l. \$395k

**DN-467 GILROY Facility:** This traditionally styled practice is perfectly situated! 1,325 sf w/ 3 ops + 1 add'l. \$75k

**DN-497 PLEASANTON Facility:** Great Location! 870 sf w/ 3 ops + 1 add'l. **Owner Financing w/10% Down! Reduced! \$95k**

## NORTHERN CALIFORNIA

**EN-340 SACRAMENTO:** Large HMO practice! 3,400 sf w/ 10 ops and Plumbed for 1 add'l \$950k

**EN-378 LINCOLN:** quality practice with a wonderful patient base! 1,369 sf w/ 2 op + 3 add'l. \$170k

**EN-379 ROSEVILLE:** An amazing opportunity in the location of your dreams! 1,040 sf w/ 3ops. \$295k

**EN-423 FOLSOM Oral Surgery Facility:** 3,450 sf w/ 2 Lrg. Treatment Rooms. **Now Only \$1 w/ Lease Assumption!**

**EN-464 ROCKLIN Facility:** Don't miss out on this remarkable opportunity! 2,150 sf w/ 4 ops. \$150k

**EN-477 DAVIS:** Rare Opportunity! 4 ops each w digital xrays. No corners cut here! \$320k

**EN-475 ROSEVILLE Facility:** Hesitate and you might miss out on this opportunity! 875 sf w/ 2 ops + 2 add'l. \$49.5k

**EG-479 FOLSOM:** History is alive here with tributes to the past! 1,600 sf w/ 3ops. \$225k

**EG-496 AUBURN:** Associate-Driven HMO practice in Downtown. 3 fully equipped ops \$315k

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### NORTHERN CALIFORNIA CONTINUED

**EN-484 FOLSOM Facility:** Come live, practice and grow here! 1,934 sf w/ 4 Ops. **\$150k**

**EN-503 FOLSOM Facility:** Take a close look at this opportunity! 2,150 sf w/5 ops. **\$225k**

**EG-508 FOLSOM Facility:** You'll want to spend your days here! 1,500 sf w/ 4 ops + 1 add'l. **\$60k**

**FN-299 FERNDALE:** Live and practice on the beautiful North Coast! 1,300 sf w/ 3 ops **\$195k (Real Estate: \$309k)**

**FC-334 NORTHERN CA:** Emphasis on prevention. 1,200 sf w/ 4 ops **\$480k / Real Estate Also Available!**

**FC-343 NORTHERN CA:** Quality & location are the keys to success! 1,200 sf w/ 3 ops + 1 add'l & 1 hyg. Op. **\$500k (Real Estate \$375k)**

**FC-415 FT. BRAGG:** Excellent practice in peaceful, family-oriented community! 1,800 sf w/ 5 ops + 1 hyg. Op. **\$425k**

**GC-472 ORLAND:** Live & Practice in charming small town community. 1,000 sf w/ 2ops. Seller Retiring. **\$160k**

**GG-386 REDDING:** Amazing Practice. Lease or Buy Real Estate! 2,860 sf w/ 4 ops. Plumbed for 2 add'l! **ONLY \$285k**

**GG-453 CHICO:** 5,000 sf 7 ops Perfect for 1 or more dentists! **\$395k**

**GG-454 PARADISE:** ~2,550 sf w 9 ops. 40 yrs goodwill! Amazing Opportunity! **\$595k**

**GN-201 CHICO:** Beautiful practice, major thoroughfare, stellar reputation! 1,400 sf w/ 4 ops & room for another **\$425k**

**GN-244 OROVILLE:** Must See! Gorgeous, Spacious. 2,500 sf w/5 ops! Collections over \$450k in 2013. **Only \$315k**

**GN-258 REDDING:** Pristine and attractive! Conveniently located! 2,100 sf w/ 3 ops + 2 add'l. **Now Only \$300k!**

**GN-399 REDDING:** Loyal patient base and relaxed workweek schedule. 1,440 sf w/3 ops. **\$150k**

**GN-418 REDDING: Goodwill Galore!** Established for ~37 years. Seller is retiring! 3,200 sf w/6 ops +2 add'l. **\$495k**

**GN-507 CHICO:** It just doesn't get any better than this! 3,000 sf w/ 7ops. Practice **\$535k Real Estate \$750k**

**HG-298 REDDING FOOTHILLS: HEALTH FORCES SALE!** Includes Cerecl! 2,000 sf w/ 5 ops. Practice **\$75k & Real Estate Also Available!**

**HN-213 ALTURAS:** Close to Oregon Border. FFS practice is 2,200 sf w/ 3ops +1 add'l **\$115k**

**HN-280 NO EAST CA:** Only Practice in Town 900 sf w/ 2 ops **\$110k**

**HN-290 PLACERVILLE: Excellent Merger Op!** FFS. 1,400 sf w/ 4 ops **\$210k**

**HG-448 LAKE TAHOE AREA: Call for Details!** Upscale Family Practice. 3400sf w 6 ops **\$725k**

### CENTRAL VALLEY

**IC-468 SAN JOAQUIN VLY:** 2500+sf, 6 ops, Motivated Seller, Price Reduced. All offers considered! **\$350k**

**IG-367 MERCED:** Newly Remodeled, Paperless. 1,550 sf w/4 ops **REDUCED! \$305k**

**IG-470 TRACY:** Amazing opportunity. 1300 sf w/ 4 ops **\$270k**

**IN-345 MODESTO:** Long-standing tradition of quality care. 3016 sf w/ 5ops + 1 add'l. **\$495k**

**IN-358 MODESTO:** Practice nets over 50%! 1,200 sf, 3 ops+1 add'l. **REDUCED! \$275k**

**IN-397 FRESNO/MADERA:** Focused on quality dental care & patient comfort! 2,000 sf w/5ops. **Seller Motivated: \$440k**

**IN-429 TRACY Facility:** "Move-in ready" Hesitate and you might miss out! 2,488 sf, 5 ops **\$245k/RE: \$650k**

**IN-474 STOCKTON:** Too good to be true? Absolutely not! 1,600 sf w/ 3 ops. **\$95k**

**IC-468 SAN JOAQUIN VALLEY:** High-End Restorative Practice! Don't miss out! 2,500 sf w/ 6ops. **\$425k**

**IN-506 TURLOCK:** Practice in the heart of the Central Valley! 2,000 sf w/ 5ops + 1 add'l. **\$425k**

**IN-512 Merced:** This immaculate practice is an absolute jewel! 1,200 sf w/ 4ops + 1 add'l. **\$140k**

**JC-349 FRESNO Facility:** Motivated Seller retiring! Step right in and make yours! **Call for Details!**

**JG-491 FRESNO:** Well-established. 40-50 new Pt/mo. 1,452 sf w/ 4 fully equipped ops **\$425k**

### SPECIALTY PRACTICES

**I-9461 CENTRAL VALLEY Ortho:** 1,650 sf w/5 chairs/bays & plumbed for 2 add'l **\$180k**

**CC-346 SO MARIN CO Perio:** 1,142 sf w/ 3 ops. Meticulously maintained! **REDUCED! \$199k**

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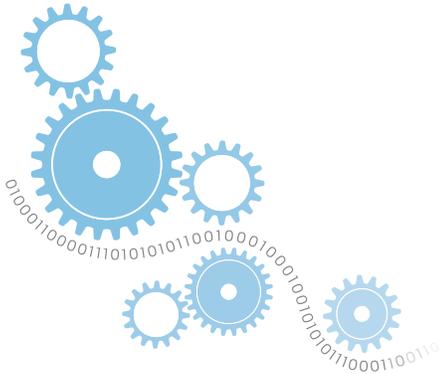
**CC-405 SOLANO CO. Endo:** Endodontic Practice in a vibrant community! 1,250 sf w/ 4 ops. **\$485k**

**IC-267 CENTRAL VALLEY Ortho:** beautifully landscaped. 1,728 sf w/ 6 chairs/bays + 1 add'l. **\$225k / Real Estate Also Available!**

**DC-459 SF PENINSULA (Perio):** 50% Partnership Buy In! Call for Details! **\$580k**

**CG-481 S SONOMA CO (Ortho):** 2070 sf w 7 chairs + 1 exam in Med/Prof Plaza **\$295k**

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## A look into the latest dental and general technology on the market

### AppleTV – 4th Generation (Apple, \$149)

Apple recently unveiled the fourth generation of AppleTV with significant upgrades over previous versions. Most notably, AppleTV now supports third-party apps and already there are thousands of apps available for download for viewing entertainment (including live sports and news), games, shopping and more. The remote control for the device has been significantly upgraded to include a touchscreen for easy thumb scrolling as the primary means of navigation. In practice, using the remote is instantly familiar for anyone who has ever used a smartphone or tablet, and is a much faster method of navigating the AppleTV as compared to the previous version of the click remote. In addition, Siri is now available as part of the AppleTV, allowing users to tell their TV exactly what they want to watch or help find something to watch by simply asking. Siri will search across popular services like iTunes, Netflix and more so the user no longer has to dig through each app individually to find something to watch. Overall, the new AppleTV is an impressive upgrade from the previous version, and with all of the expanded functionality coupled with a faster processor, larger hard drive (for storing all of those apps) and much improved remote, Apple has definitely raised the bar on connected smart devices for the living room.

– Blaine Wasylkiw, CDA director of online services

### Apple CarPlay (Apple)

Apple CarPlay brings users an innovative, hands-free experience for key iPhone apps while driving. Available built-in on select automobiles and after-market navigation systems, users with an iPhone 5 and newer can take advantage of CarPlay by connecting their devices through USB or Bluetooth (if supported). Once connected, the CarPlay home screen appears on the vehicle display. Familiar apps such as Phone, Music, Maps, Messages, Podcasts and Audiobooks appear as large icons on the screen. Users only need to tap on the vehicle touchscreen to open an app. A virtual home button on the lower left corner serves as the means to return to the main screen of apps. CarPlay uses a combination of Siri and limited touchscreen gestures to reduce driver distractions. For example, tapping on the Phone app launches Siri so the driver can say something like, “Call home” or, “Play my voicemails.” Drivers can also select from limited favorites, contacts, recent calls, voicemails and a keypad on the display within the Phone app. Calls

appear on the vehicle display with a familiar iPhone-like interface. The Messages app functions in a similar manner, mainly using Siri as the primary means of sending and receiving text messages. Instead of displaying text messages on the screen, Siri reads them to the driver so his or her eyes can remain focused on the road. Maps provide turn-by-turn navigation directions, traffic conditions and estimated arrival times for destinations. The Music, Podcasts and Audiobooks apps look and function similarly to their iPhone counterparts by projecting a simplified interface to search and select audio content from which to play. Any third-party audio apps compatible with CarPlay are automatically added to the home screen. With a remarkably recognizable interface that needs no introduction, Apple CarPlay makes it easy for drivers to use their iPhones without being distracted by using their hands. Using a simple interface that puts only the essential elements on the vehicle display and relying mainly on voice recognition to perform actions, drivers will find the hands-free experience pleasantly productive.

– Hubert Chan, DDS

### Text Message Intervention Program Reduces Binge Drinking

Text messaging may help reduce binge drinking, according to a new study conducted by the University of Pittsburgh School of Medicine. Specifically, text message-based intervention can reduce how much alcohol young adults drink. The 12-week study included 765 18- to 25-year-olds. A control group received no text messages, a self-monitoring group received a text on “Sundays asking about drinking quantity but received no feedback” and another group received text messages “on Thursdays inquiring about weekend drinking plans and promoting a goal commitment to limit drinking, followed by another text on Sunday to inquire about actual drinking and give tailored feedback aimed at reducing alcohol consumption.” All of the participants had been discharged from emergency rooms recently. Those who participated in the full program said they had one less day of binge drinking a month and also showed a 12 percent decrease in binge drinking. The other two groups showed no reduction.

–Blake Ellington, Tech Trends Editor



## Protest Now

Adam argued with Eve, but they soon realized that the only thing worse than being on the wrong side of an argument is to be on the right side with no one listening except a snake.

Robert E.  
Horseman,  
DDS

ILLUSTRATION  
BY VAL B. MINA

Sta-tis-tic \ *sta-'tis-tik* \ n 2 a: a quality that is computed from a sample.

Stat-is-ti-cian \ *stat-a-stish-an* \ n: one who carefully assembles facts and figures for others who carefully misinterpret them.

Not once in recent memory have any of my friends asked for my opinion on anything. In my immediate family, my input is required only occasionally when there is some question as to who takes out the trash or is responsible for activating the air conditioner because it is 84 degrees in here right now.

It's not that I am unappreciated or ignored. Every weekend outside the entrance to the supermarket, I am eagerly approached by complete strangers asking me for help in saving the endangered

fringed lizard in southwest Arizona or signing a reasonable demand for transgender restrooms at city hall. Caller ID on my phone is the only thing that prohibits me from making new friends who would welcome me in joining them in a predeath special offering at a caring crematorium available this week only.

Which brings up the subjects of statistics and polls. Both must be considered forms of entertainment bereft of verifiable facts and flexible as a politician's campaign promises. Humans are natural-born arguers. Adam argued with Eve, but they soon realized that the only thing worse than being on the wrong side of an argument is to be on the right side with no one listening except a snake. Animals, of

course, have arguments, but the disputes usually end with the beta participant deciding to find a mate of his own.

So the art of arguing has evolved over the millennia with the enthusiastic support of the media to the point that a man who knows how to argue well is no proof that he has to know what he's arguing about. To ensure that polls, statistics and arguing never suffer demise like that of the buggy whip and the 25-cent hamburger, there is America's basic unalienable concept of Freedom. We have the freedom to do or say almost anything but yell "Fire!" in a theater or deny your pre-adolescent of his cellphone.

Back in the day, my mother impressed upon me after a particularly sulphurous discourse with my younger sister, that certain words were not acceptable at our house and I should always remember "If you can't say something nice, don't say anything at all." Rather than remain mute for the balance of my life, I have learned that certain subtleties and heavily disguised sarcasm can usually allow me all the freedom of speech I need without inciting physical contact.

Today social media posts are rife with inflammatory comments. The phenomena of Facebook, Twitter and others whose main attraction is freedom of speech coupled with anonymity embraces the right to be offensive and an equal right to be offended. Meanwhile if you can't say something nice, don't say anything at all — formerly known as good manners — continues to decline like bipartisanship at a political debate.

When participating commentators with opposing views eventually arrive at the "Yeah, your mother wears Army boots" stage of escalating incivility countered by the devastating revelation that "You're a stooped ##\*@!! idjit!," it's time to hit the streets.

Now that I am of a certain age when

Meanwhile if you can't say something nice, don't say anything at all — formerly known as good manners — continues to decline like bipartisanship at a political debate.

being fast on the uptake is secondary to a good nap and the regularity afforded by Metamucil, I have noticed incendiary arguments and heated protests are essentially the same. The latter are louder and more confrontational to the point where the calendar recognizes October 21 as National Protest Day fueled by the grapes of wrath instead of the traditional bladder-provoking libation of Oktoberfest. Like mattress sales, somewhere at any given moment a protest is in full swing.

These are not your old-time protests hastily scrawled with crayon on chunks of cardboard with spelling commensurate with the protester's education. Take either side, when offenders and offendees occupy busy intersections, their signs are premade, graphic arts productions to the wavers' specifications. There is Big Money to be made by zealous protesters' discontent. Why not me?

An acquaintance dropped by recently.

"Hey, good to see you," I greeted. "Love your ponytail, very trendy."

"Well, lots of guys have 'em. Even George Washington, the father of our country wore one.

"That was a peruke," I corrected.

"No, it wasn't!"

"Yes it was — attached to his wig. Martha insisted he take it off at night prior to his hitting the four-poster. What do you do with yours, undo a

rubber band?" He got up to leave.

"What? Are you offended?"

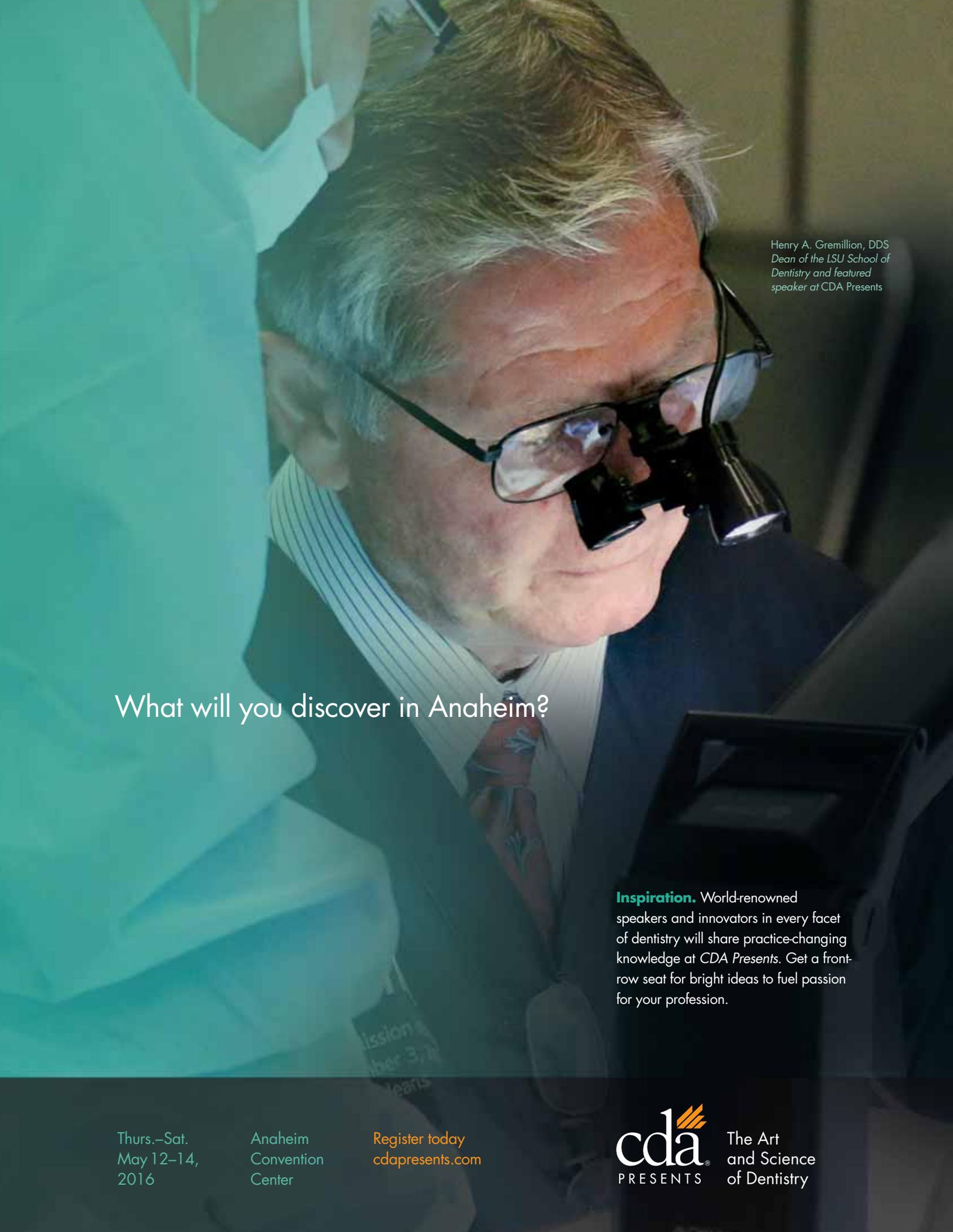
You want to protest?"

"Well, sure, I guess," he hesitated.

"Good!" I opened my desk drawer and offered him a printed list of things he should consider to make his protest more effective.

1. A bull horn, because the less valid a man's protest is, the louder he talks.
2. Signs in brilliant colors with an attractive choice of fonts and wording, but essentially containing the message that whatever it is you want, you want it Now! (multiple exclamation marks recommended). And deliberate misspelling here and there depending on the IQ of your opposition and its addiction to texting.
3. Pick from this list of simple chants that can be done in harmony with a certain number of your fellow protesters who have no clear idea of what your mission is, they just like to join anything that gets them out of the house. Popular now is this copyrighted four-part chant: *What do we want? (your choice of two words) When do we want it? Now!*

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