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May 2014

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FEATURES

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Notice to CDA Members

In order to better serve our members, CDA is in the process of implementing a new association management software system that will enable CDA to update and streamline processes. The new software system will go live on July 1. At that time, members will be sent a link and asked to create a new user account, which will allow access to Practice Support, e-learning courses, the CDA Store and online dues renewal on cda.org. Due to the software system transition, there will a short period where online purchasing will not be available between June 25 and July 1. We apologize for any inconvenience this may cause. CDA will keep members updated on the implementation process, and we will notify you at the beginning of July when it is time to create a new user account.

CDA JOURNAL, VOL 42, N°5

Jury Duty

Kerry K. Carney, DDS, CDE

The presumption of innocence is not a robust right. It can be easily influenced and lost in headlines.

Life is full of opportunities to practice patience. The other day, as a prospective juror, I spent seven hours witnessing the process of jury selection. It was an opportunity to observe formal, institutional, human interaction.

The judge invited the jurors to express their prejudices and they were not shy about it. The defendant was accused of committing an emotionally charged and heinous crime. When the defense attorney asked the jurors if they were to cast their votes right then, before any evidence had been presented or any witnesses called, could they find the defendant not guilty, several jurors shook their heads "no." On follow-up, the attorney asked why they were unable to give her client the presumption of innocence. One person said, "Because he just looks guilty."

By the time the jury pool was dismissed I could not help but agree with a paraphrase of a quote from Winston Churchill: "The best argument against the jury system is a five-minute conversation with the average prospective juror."

Granted, some of the individuals may have embellished their prejudices in order to be excused from jury duty, but it gave me pause.

Trials are a perennially popular setting for drama. In Kurosawa's classic 1950 film, *Rashomon*, the accounts of four eyewitnesses to the same murder are all plausible and contradicting. One is left to wonder about the very nature of truth and justice.

The prospective jurors' easy disregard for the defendant's presumption of innocence was disturbing. For some, it was unnecessary to burden the prosecution with proving the defendant was guilty. It left me thinking about a recent real-life courtroom drama involving a dentist in New York.

Leonard Morse, DDS, is a dentist who used to have a very large practice in Park Slope, Brooklyn. He was one of the "top Medicaid billers in the state."[1] The fact that he had a high profile with regard to reimbursement meant that his office was audited on a number of occasions. All the scrutiny failed to turn up billing irregularities, but it did make him a familiar name. When it came to "rounding up the usual suspects" for a fraud investigation, he had a target on his back.

Dr. Morse had the misfortune of living in an "interesting time" in New York politics.

In 2006, Eliot Spitzer was the attorney general for New York State and was running for governor. He was building on his reputation as the "sheriff of Wall Street" and on his prosecution of organized crime to fashion a political profile for his campaign: he would be tough on crime.

Though Spitzer was the Democratic front-runner in the primary contest, he was getting slammed as being "soft on Medicaid fraud"[2] by his opponent. A high-profile Medicaid fraud prosecution might help counter that accusation. Dr. Morse could be a convenient "fall guy."[2]

Dr. Morse had endured five Medicaid audits. The first was in 1980 and the fifth was in 2002. None of the first four audits had found any abuse or fraud. Other than a request for original laboratory prescriptions in 2004, Dr. Morse had heard no more about the 2002 audit. The gubernatorial election was to be held in 2006.

In April 2006, the 2002 audit of Dr. Morse's practice was presented at a grand jury and a B felony indictment was secured against him, alleging that he had stolen $1 million through Medicaid fraud. A B felony is very serious. If convicted, Dr. Morse would go to prison for a minimum of five years. The maximum was 25 years.

The election was held. Spitzer won and became governor on Jan. 1, 2007. On March 17, 2008, the governor resigned after his role in a prostitution scandal was revealed.

It took just five days following the indictment for Dr. Morse's life to change forever. He lost his patients, his practice, his professional positions, his house and, worst of all, his reputation. Though he won his criminal trial 17 months later, his life was "still in shambles."[3] His losses were estimated at $6.1 million.

Dr. Morse believed that what happened to him should not go unnoticed and unaccounted for. Dentists are nothing if not dogged in their pursuit of goals. Dr. Morse decided to right

this wrong. He found a civil rights attorney who was equally incensed by the prosecution's behavior.

In November 2007, they filed a $75 million lawsuit alleging that Dr. Morse was falsely arrested and maliciously prosecuted.[4]

The federal magistrate judge ruled that unredacted emails, depositions and trial transcripts be made available to Dr. Morse. He found that the grand jury had been given "illustrative summaries" of his billings rather than real billings from his records. Three of Dr. Morse's patients with identical names were merged into one entity that indicated fraudulent billings of $2,370. Tooth numbers were removed from the billings and the grand jury was led to believe that Dr. Morse was doing multiple billings for the same dental work and being paid for these multiple billings.

Only 12 patients were interviewed and then only by telephone, not in person. No grand jury patient witness underwent a clinical examination. Dr. Morse's indictment was posted on the official attorney general's website and was not removed until two years after his acquittal.

Because of the nature of the prosecutor's duties, it is very difficult in our legal system to win a court decision against the office. Dr. Morse was able to prove to the court that his indictment was the result of purposely fabricated evidence.[2]

In 2013, Dr. Morse won a $7.7 million verdict against the state.[4]

Though he won his David-and-Goliath struggle, in some ways he was like the defendant whom the prospective jurors found so easy to condemn out of hand. The fact that a dentist who sees a significant number of Medicaid patients could have a very successful practice means to some folks that he must be doing something illegal. The presumption of innocence is not a robust right. It can be easily influenced and lost in headlines.

Dr. Morse was a victim of political expediency. His is a cautionary tale that reminds us of the wisdom of Pericles, who said, "Just because you do not take an interest in politics doesn't mean politics won't take an interest in you." ■

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CDA JOURNAL, VOL 42, N°5

Motivating Patients

I found the article, "The Proximal Surface of Morality," by David W. Chambers, EdM, MBA, PhD, in the March 2014 issue of the *Journal* very challenging.

He separated good dentistry from good oral health. One would think that they are synonymous, but I agree they are not. Good dentistry is accomplished in a dental facility, as promoting good oral health should also be. However, because of patients' need for skillful therapy and the imposition of outside factors, it seldom is. So what can we do to improve oral health outside the dental facility? Efforts by organized dentistry using different media, private advertisers, etc., have had little success in my opinion.

One way that I found to be more effective is to motivate patients to do some self-evaluating of their teeth and oral tissues. How? This was tried by the San Francisco Dental Society (SFDS) back in the 1970s, using the audiovisual facilities of the 10 largest corporations in the vicinity. We did this by hiring a public relations person who got us an appointment with the mayor, whom we impressed with our presentation about prevention and oral health. The mayor then asked the 10 corporation representatives to attend a meeting in his office to listen to our presentation. They were asked to offer their facilities for our speakers, which they did. An SFDS member gave a talk during the employee lunch hour and with the use of slides explained in simple terms how plaque and excretions of bacteria cause caries, discoloration and gingivitis. I repeat, the terms should always be kept simple and easy to understand. And by using slides we were able to demonstrate how this process could be minimized using floss, etc. However, the key to motivating the audience, I think, was giving them a pamphlet of instructions regarding home care, disclosing tablets, a mouth mirror, toothbrush, floss and a dentifrice with fluoride. It was all free and served as an attraction for the large audience.

Speakers' names were not disclosed to avoid the appearance of promoting office visits.

Good dentistry could follow when the patient had an awareness of the need for oral health care. The disclosing tablet and mouth mirror could help to achieve that.

Imagine the ramifications of this concept if it was implemented by many other CDA components … let alone nationwide.

Thank you, David.

Frank A. Brucia, DDS
San Francisco, Calif.

The *Journal* welcomes letters

We reserve the right to edit all communications. Letters should discuss an item published in the Journal *within the past two months or matters of general interest to our readership. Letters must be no more than 500 words and cite no more than five references. No illustrations will be accepted. Letters should be submitted at editorialmanager.com/jcaldentassoc. By sending the letter, the author certifies that neither the letter nor one with substantially similar content under the writer's authorship has been published or is being considered for publication elsewhere, and the author acknowledges and agrees that the letter and all rights with regard to the letter become the property of CDA.*

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Measurements based upon 4.3mm diameter, 13mm length implants. Dimensions can vary.

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Well and Good

David W. Chambers, PhD

I just reviewed a manuscript for possible publication that reported on the fabrication of knockdown-gorgeous provisional anterior restorations. I shared it with a colleague who wondered why a patient would spend the time and money involved for such a temporary device. "Well" is an adverb describing how something was done; "good" is an adjective characterizing whether the outcome was worthy.

Richard Selzer is a surgeon who writes memorable reflections on practice. In his *Letters to a Young Doctor*, Selzer recounts a true story that challenges the technical definition of quality medical care to its very core. The story is called "Imelda," for a 14-year-old Honduran girl with a deforming cleft lip. A revered surgeon examined her and prepared her for surgery on a mission trip to the poorest part of that country. However, Imelda died of adverse reactions to the anesthesia just as the surgery was starting.

Later that night the surgeon, alone and by lantern light, went to the hospital morgue and completed the reconstructive procedure.

The story concludes with a triumphal presentation of before-and-after case reports from the mission trip given by the surgeon at his home hospital. The before photograph of Imelda was displayed, but the surgeon realized that he was physically incapable of calling for the postsurgical photograph, the one taken in the morgue. Selzer, who according to the story served as an assistant on the Honduran trip, removed the follow-up photo, and the presentation continued.

On one reading of this story, the surgeon is a hero who responded to a mother's unspoken hopes that her daughter would be buried with a smile. Charity is intrinsically noble. The more troubling read is that the surgeon placed his own reputation for technical accomplishments above all else. We are encouraged by Selzer to see it that way because he adds two detailed descriptions from the surgeon of the technical protocol for repairing a cleft lip. It is a mechanical art that proves the mastery of the operator. Selzer's reason for removing the slide during the report to colleagues is that it would have exposed the surgeon as violating a core professional value by performing surgery in a morgue and it would have documented that the surgeon was not "perfect."

I recently had occasion to present eight cases in dental ethics to almost 100 dentists who were asked to rate various potential actions and reasons for managing moral conflicts. The same eight cases were rated by about an equal number of patients. The good news is that the "unworthy moves and questionable justifications" were similar in both groups. The bad news is that in the deep structure analysis, dentists organized their approach to dental ethics around technical dimensions of treatment. Patients tended to see ethical dentistry in terms of promoting good oral health. ■

The nub:

1. Moral means the right thing for the right reason.

2. Technical standards alone are insufficient.

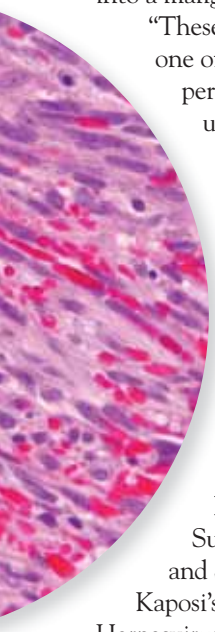
3. Dentists are answerable to the standards of the public as well as of their peers.

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

Byproducts of Bacteria-causing Gum Disease Incite Deadly Oral Cancer Growth

Researchers from Case Western Reserve University have discovered how byproducts in the form of small fatty acids from two bacteria prevalent in gum disease incite the growth of deadly Kaposi's sarcoma (KS)-related lesions and tumors in the mouth.

The discovery could lead to early saliva testing for the bacteria, which, if found, could be treated and monitored for signs of cancer and before it develops into a malignancy, researchers say.



"These new findings provide one of the first looks at how the periodontal bacteria create a unique microenvironment in the oral cavity that contributes to the replication of the Kaposi's sarcoma herpesvirus (KSHV) and development of KS," said Fengchun Ye, the study's lead investigator.

The discovery is described in the *Journal of Virology* article, "Short Chain Fatty Acids from Periodontal Pathogens Suppress HDACs, EZH2, and SUV39H1 to Promote Kaposi's Sarcoma-Associated Herpesvirus Replication."

The research focuses on how the bacteria, *Porphyromonas gingivalis* (Pg) and *Fusobacterium nucleatum* (Fn), which are associated with gum disease, contribute to cancer formation.

Ye said high levels of these bacteria are found in the saliva of people with periodontal disease, and at lower levels in those with good oral health — further evidence of the link between oral and overall physical health.

KS impacts a significant number of people with HIV, whose immune systems lack the ability to fight off the herpesvirus and other infections, he said.

Also at risk are people with compromised immune systems: people on medications to suppress rejection of transplants, cancer patients on chemotherapies and the elderly population whose immune systems naturally weaken with age.

The researchers wanted to learn why most people never develop this form of cancer and what it is that protects them.

"The most important thing to come out of this study is that we believe periodontal disease is a risk factor for Kaposi's sarcoma tumor in HIV patients," Ye said.

With that knowledge, Ye said those with HIV must be informed about the importance of good oral health and the possible consequences of overlooking that area.

For more information, see the study published online Feb. 5, 2014, ahead of print in the *Journal of Virology*.

Negative Health Impacts of Tobacco Does Not Prevent Smokers From Lighting Up

Smokers are more likely to view anti-smoking ads negatively than non-smokers, according to a new study by the Institut universitaire en santé mentale de Montréal and Université de Montréal.

Le-Anh Dinh-Williams, the study's first author, made the following statement: "The brains of the smokers in our study were more aroused by images that showed smoking in a positive light than by images that encouraged them to stop." They were also more affected by aversive non-smoking related images than by images of the specific negative consequences of smoking."

Stéphane Potvin, a co-author of the study, discovered that "motivation" regions of the brain are activated in smokers when they see positive messages about smoking and less so when negative messages appear.

The American Lung Association states that every year in the U.S. more than 392,000 people die from tobacco-caused disease; another 50,000 people die from exposure to secondhand smoke; among adults who have ever smoked, 70 percent started smoking regularly at age 18 or younger, and 86 percent at age 21 or younger; among current smokers, chronic lung disease accounts for 73 percent of smoking-related conditions; and smoking harms nearly every organ in the body and is a main cause of lung cancer and chronic obstructive pulmonary disease (COPD), including chronic bronchitis and emphysema. It is also a cause of coronary heart disease, stroke and a host of other cancers and diseases.

For more information on the study, see the April 2014 issue of the journal *Progress in Neuro-Psychopharmacology and Biological Psychiatry.*

Study Finds 'Mineral Tomb for Microbiomes'

New research has unearthed a "microbial Pompeii" in teeth that are in the range of 1,000 years old. The research, which was led by scientists from the University of Zürich, the University of Copenhagen and the University of York, found that dental calculus preserves bacteria and microscopic particles of food on the surfaces of teeth. This creates a "mineral tomb for microbiomes."

The discovery has led scientists to believe that there is not much difference in what causes periodontal disease today from what caused it thousands of years ago.

In total, 32 scientists in seven countries participated in the research study. According to the University of York, researchers "applied shotgun DNA sequencing to dental calculus for the first time. They reconstructed the genome of a major periodontal pathogen and produced possibly the first genetic evidence of dietary biomolecules to be recovered from ancient dental calculus."

The University of York quoted Dr. Warinner of the University of Zurich and the University of Oklahoma as saying, "Dental calculus acts both as a long-term reservoir of the oral microbiome and as a trap for dietary and environmental debris. This allows us to investigate health and disease, as well as reconstruct aspects of an individual's life history and activities. Never before have we been able to retrieve so much information from one small sample."

The challenging part of the research came from sorting and identifying millions of genetic sequences to allow for construction of the biology of the ancient oral microbiome. But Dr. Enrico Cappellini of the University of Copenhagen, a senior author of the study, called the dental calculus a "battlefield archaeological site, just at the molecular scale."

Moderate to severe periodontal disease affects more than 10 percent of the world's population.

For more information on the study, visit york.ac.uk/news-and-events/news/2014/research/dna-calculus.

Tooth Fairy Leaving Average of $3.70 per Tooth

Tooth Fairy spending skyrocketed in 2013 and shows no signs of slowing down, according to an annual survey, which reveals that American children are receiving an average of $3.70 per lost tooth — a dramatic increase of 23 percent compared to the $3.00 per tooth left in 2012 and a 42 percent increase over the $2.60 left in 2011. Based on this rate of return, a child would net a substantive $74 for a full set of 20 baby teeth.

Additional findings from the Visa survey include:

The Tooth Fairy was particularly generous to kids in the Northeast, leaving an average of $4.10 per tooth. Kids in the West and South trailed with an average of $3.70 and $3.60, respectively. Midwestern children found the least under their pillows with an average of $3.30 per tooth.

Ten percent of kids will find more than $5 per tooth under their pillows — more than three times as many as in 2011.

Thirty-six percent of respondents reported that the Tooth Fairy left a dollar or less.

On the opposite end of the spectrum, 6 percent said that the Tooth Fairy left $20 or more, including 2 percent who reported that an extremely generous Tooth Fairy left $50.

Nationwide, the Tooth Fairy left the most in households with young parents. The 18-24 age group reported that she left an average of almost $5 per tooth.

The Tooth Fairy will be visiting close to 90 percent of U.S. households with children—up from 84 percent previously.

Visa conducts the survey, in part, to promote its free financial education program, *Practical Money Skills for Life*, which offers resources including personal finance articles, games and lesson plans for educators, parents and children.

For more information, see the news release at practicalmoneyskills.com/about/press/releases_2013/0830.php.

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Early Childhood Caries: A Combination of Bacterium and *Candida*?

A combination of bacterium and *Candida* could be the main culprit of early childhood caries, according to a new paper published ahead of print in *Infection and Immunity*, a publication of the American Society for Microbiology.

The study found that a combination of *Streptococcus mutans* (*S. mutans*) and *Candida albicans* (*C. albicans*) doubles the number of cavities, and in a study done on rats, increased the severity of the disease.

Traditional knowledge has suggested that microbes are the reason for plaque, but Hyun (Michel) Koo of the University of Pennsylvania and collaborators noticed that candida was typically present when dealing with early childhood caries.

According to an article published by the American Society for Microbiology, "The investigators discovered that the 'exoenzyme' which *S. mutans* uses to react with sugar to produce EPS, also enables *Candida* to produce a glue-like polymer in the presence of sugar, allowing it to adhere to teeth, and to bind *S. mutans*, two abilities it otherwise lacks. Under these circumstances, the fungus now contributes the bulk of the plaque.

"The combination of the two organisms led to a greatly enhanced production of the glue-like polymer, drastically boosting the ability of the bacterium and the fungus to colonize the teeth, increasing the bulk of the biofilms and the density of the infection," Koo said in the article. "All that led to greatly elevated accumulation next to the teeth of the acid that dissolves enamel, leading to cavity formation.

"This represents a truly unique physical interaction where a bacterially produced product attaches to and functions on the surface of an organism from another kingdom, converting this normally innocuous (with respect to teeth) fungus into a fierce stimulator of cariogenic biofilm formation," Koo said.

Published online ahead of print, Feb. 24, 2014, at bit.ly/asmtip0314b. The final version of the article is scheduled for the May 2014 issue of *Infection and Immunity*.

Genes Could Be Helpful in Preventing Dental Disease

Researchers at the University of Adelaide say a patient's genes could eventually become a key factor in providing oral health care.

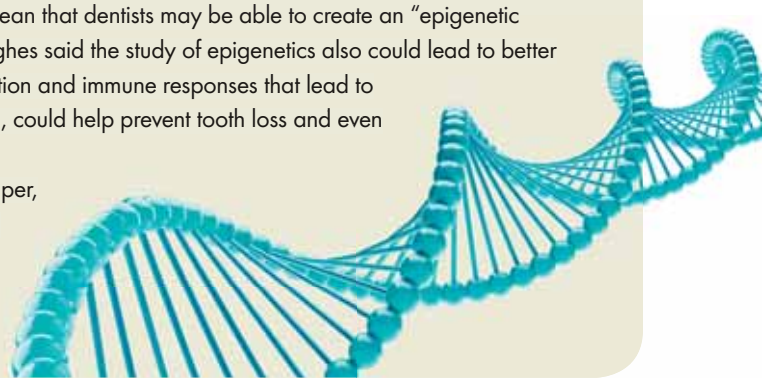
Specifically, researchers looked into what epigenetics could bring to future treatment and prevention of dental disease. The research appears in a new paper published in the *Australian Dental Journal*.

One of the authors of the article, Associate Professor Toby Hughes, said, "Our genetic code, or DNA, is like an orchestra – it contains all of the elements we need to function – but the epigenetic code is essentially the conductor, telling which instruments to play or stay silent, or how to respond at any given moment."

"This is important because, in the case of oral health, epigenetic factors may help to orchestrate healthy and unhealthy states in our mouths. They respond to the current local environment, such as the type and level of our oral microbes, regulating which of our genes are active. This means we could use them to determine an individual's state of health, or even influence how their genes behave. We can't change the underlying genetic code, but we may be able to change when genes are switched on and off," Hughes continued.

The findings could mean that dentists may be able to create an "epigenetic profile" of a patient. Hughes said the study of epigenetics also could lead to better understanding inflammation and immune responses that lead to periodontitis. This, in turn, could help prevent tooth loss and even oral cancer.

To read the entire paper, go to the Feb. 24, 2014 issue on the *Australian Dental Journal's* website.

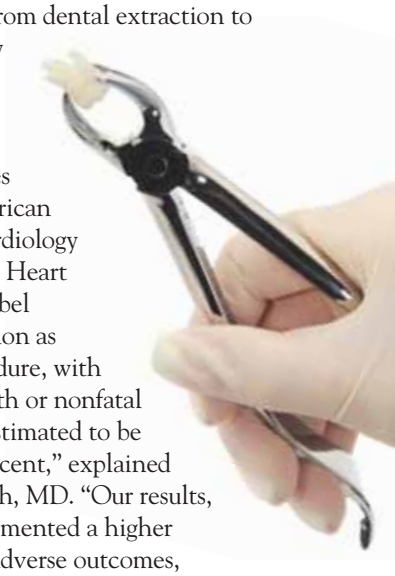


Tooth Extraction Prior to Cardiac Surgery May Increase Risk of Adverse Outcomes

Removing an infected tooth prior to cardiac surgery may increase the risk of major adverse outcomes, including risk of death prior to surgery, according to a study in *The Annals of Thoracic Surgery*.

Dental extraction of abscessed or infected teeth is often performed to decrease the risk of infection during surgery and endocarditis (an inflammation of the inner layer of the heart) following surgery.

Researchers from the Mayo Clinic in Rochester, Minn., evaluated the occurrence of major adverse outcomes in 205 patients who underwent at least one dental extraction prior to planned cardiac surgery from 2003 to 2013. The median time from dental extraction to cardiac surgery was seven days (average 35 days).



"Guidelines from the American College of Cardiology and American Heart Association label dental extraction as a minor procedure, with the risk of death or nonfatal heart attack estimated to be less than 1 percent," explained Mark M. Smith, MD. "Our results, however, documented a higher rate of major adverse outcomes, suggesting physicians should evaluate individualized risk of anesthesia and surgery in this patient population."

In this study, patients who underwent dental extraction prior to cardiac surgery experienced an 8 percent incidence of major adverse outcomes, including new heart attack, stroke, kidney failure and death. Overall, 3 percent of patients died after dental extraction and before the planned cardiac surgery could be performed.

"With the information from our study we cannot make a definitive recommendation for or against dental extraction prior to cardiac surgery," said Joseph Dearani, MD, noting the limitations of their retrospective review. "We recommend an individualized analysis of the expected benefit of dental extraction prior to surgery weighed against the risk of morbidity and mortality as observed in our study."

For more information, see the study in *The Annals of Thoracic Surgery*, March 2014, vol. 97, no. 3, pp. 838-844.

Good Fungi Keep Bad Ones in Check

The human mouth contains a balanced mix of microbes which, when disrupted, can lead to oral diseases. A new study from Case Western Reserve University compares the bacteria and fungi present in the mouths of healthy individuals with those from patients infected with HIV. This study illustrates why oral candidiasis is a common complication of HIV infection.

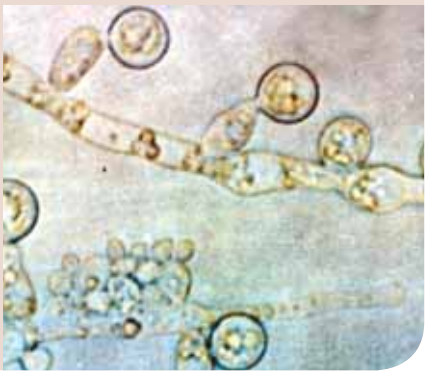
Using high-throughput gene sequencing, Mahmoud Ghannoum and his colleagues catalogued the core oral bacteriome and the core oral mycobiome. They found little difference in the bacteria between healthy individuals and those infected with HIV. In contrast, they saw clear and consistent differences in the oral fungi between both groups.

A family of fungi called *Candida* was predominant in both groups, but present at higher levels in HIV-infected individuals. A second one, called Pichia, was present at fairly high levels in the mouths of healthy individuals but only at lower levels in HIV-infected people. This led the researchers to speculate that there was an antagonism between the two. When they grew *Pichia* alone in a liquid medium and then filtered the fungus out, the "*Pichia* spent medium" (PSM) was able to suppress the growth of *Candida,* as well as several other disease-causing fungi.

Oral candidiasis is a common opportunistic infection in patients with HIV/AIDS. Even in the era of effective antiretroviral therapy, it compromises the quality of life for many patients.

The authors said, "Our findings have wide implications regarding the discovery of novel antifungal agents and will open the way to new therapeutic approaches for the management of fungal infections." They added, "Detailed investigations are warranted to purify and characterize the specific *Pichia* factor(s) that can inhibit *Candida* and other disease-causing fungi."

Read more in the study published in the March 13th issue of *PLOS Pathogens*.



Dentists Should Screen More for Diabetes

People may have diabetes and not even know it. According to the Centers for Disease Control and Prevention, 25.8 million people have diabetes. Of these, 7 million have undiagnosed disease.

Getting treatment for diabetes early is crucial to avoiding complications such as kidney failure, blindness and increased risk of heart disease and stroke. In order to target the undiagnosed, health care providers are working to make diabetes testing available in a variety of health care settings.

With this in mind, University at Buffalo researchers have published results from one of the first studies that focused specifically on the diabetic HbA1c blood test and whether or not it is feasible to perform it chairside in dental offices.

The results appeared in the Jan. 1, 2014, issue of *The Journal of the American Dental Association*.

According to the study's first author, Robert J. Genco, DDS, PhD, and State University of New York distinguished professor of oral biology and microbiology and immunology, while dentists have been conducting patient blood sugar tests for some time, very little in the way of field trial research is available regarding dental visits and HbA1c testing.

The HbA1c blood test is considered essential for patients with diabetes and prediabetes because its results can reflect an individual's blood sugar control from anywhere from four weeks to three months — not just that day. It doesn't require fasting and can be done with a finger stick.

Genco said the goal of the study was to determine how practical it is to perform the HbA1c test for diabetes as part of a regular dental visit, recognizing that about two-thirds of individuals in the U.S. visit a dentist at least yearly.

"Research has shown that uncontrolled diabetes is associated with an increased progression of periodontal disease," said Genco. "And those with diabetes and periodontal disease may have worse glycemic control and may be at greater risk for heart and kidney complications."

Genco noted that the treatment of periodontal disease in patients with uncontrolled diabetes may actually improve glucose control in some patients.

For more information, see the entire study in the Jan. 1, 2014 issue of *The Journal of the American Dental Association*.

Hop Leaves Could Fight Dental Diseases

Scientists reported recently that the part of hops that isn't used for making beer contains healthful antioxidants and could be used to battle cavities and gum disease. In a new study in the American Chemical Society's *Journal of Agricultural and Food Chemistry*, they say that they've identified some of the substances that could be responsible for these healthful effects.

Yoshihisa Tanaka and colleagues note that their earlier research found that antioxidant polyphenols, contained in the hop leaves (called bracts) could help fight cavities and gum disease. Extracts from bracts stopped the bacteria responsible for these dental conditions from sticking to surfaces of teeth and prevented the release of some bacterial toxins. Every year, farmers harvest about 30,000 tons of hops in the United States, but the bracts are not used for making beer and are discarded. Thus, there is potentially a large amount of bracts that could be repurposed for dental applications. However, very few of the potentially hundreds of compounds in the bracts have been studied. Tanaka's group decided to investigate what substances in these leaves might cause those healthful effects.

Using a laboratory technique called chromatography, they found three new compounds, one already known compound that was identified for the first time in plants and 20 already known compounds that were found for the first time in hops. The bracts also contained substantial amounts of proanthocyanidins, which are healthful antioxidants.

For more information, see the study published in the *Journal of Agricultural and Food Chemistry*, 2014, 62 (10), pp 2198–2206.

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9:30 a.m.—5:30 p.m.

Required Courses — Ticket Required

7 AM | 8 AM | 9 AM | 10 AM | 11 AM | Noon | 1 PM | 2 PM | 3 PM | 4 PM | 5 PM | 6 PM

- **Infection Control** *Arns,* ACC Ballroom C/D
- **California Dental Practice Act** *Thomason,* ACC Ballroom C/D

The Spot — The Smart Dentist Series, Free Lectures in the Educational Theater

- **Regulatory Compliance** *Pichay*
- **Manuals and Policies** *Thomason*
- **Mobile Marketing** *McCollough*
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- **Exquisite Anterior Provisionals*** *Brady,* ACC 213 A
- **TDIC Risk Management*** *Sahota, Curley,* Hilton California A
- **Anesthesia and Maxillofacial Human Cadaver Dissection*** *Hawkins, Paxton,* ACC 213 D
- **Implant Overdenture Methods*** *Massad,* ACC 213 B
- **Social Media and Online Marketing*** *Mele,* ACC 303 C/D
- **Intraoral Radiographs and Digital Images*** *Johnson, et al.,* ACC 213 C — **Canceled**
- **Equipment Care and Repair*** *Yaeger Sr. & Jr.,* ACC Exhibit Hall D
- **Laser-assisted Dentistry*** *Cardoza, Riley,* ACC 210 C

- **Exquisite Anterior Provisionals*** *Brady,* ACC 213 A
- **TDIC Risk Management*** *Sahota, Curley,* Hilton California A
- **Anesthesia and Maxillofacial Human Cadaver Dissection*** *Hawkins, Paxton,* ACC 213 D
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- **Equipment Care and Repair*** *Yaeger Sr. & Jr.,* ACC Exhibit Hall D
- **Laser-assisted Dentistry*** *Cardoza, Riley,* ACC 210 C

International Symposia of Dental Learning

- **Integrating Restorative Natural Teeth and Implants** *Diez Gurtubay,* ACC 204 C
- **Treatment of the Edentulous Maxillary** *Diez Gurtubay,* ACC 204 C

Express Lectures — Speakers New to the Podium

- **How to Not Fail in Private Practice** *Salierno,* ACC 205 A/B
- **Fundamentals of Biomimetic Dentistry** *Alleman,* ACC 206 A/B
- **Oral Comfort Care and Hospice** *Kelsch,* ACC 207 A/B
- **Customizing Digital Denture Technology** *Rossopoulos,* ACC 205 A/B
- **Tooth Pain But No One Can Find Anything Wrong** *Lovell,* ACC 206 A/B
- **Domestic Violence Recognition and Intervention** *Coupal,* ACC 207 A/B
- **Social Media: Leverage or Liability?** *Nation,* ACC 205 A/B
- **Excellence in Bonding Paradigm** *Simos,* ACC 206 A/B
- **The Mouth as the Body's Mirror** *Said-Al-Naief,* ACC 207 A/B

7 AM | 8 AM | 9 AM | 10 AM | 11 AM | Noon | 1 PM | 2 PM | 3 PM | 4 PM | 5 PM | 6 PM

Air Techniques Corporate Forum (C.E. Exhibit Floor Hall D)

7 AM | 8 AM | 9 AM | 10 AM | 11 AM | Noon | 1 PM | 2 PM | 3 PM | 4 PM | 5 PM | 6 PM

- **Infection Control** *Menage Bernie* — 10 AM
- **Digital Diagnostics** *Kachalia* — Noon
- **Digital Imaging Diagnostics** *Jablow* — 2 PM
- **EMPOWER-ing Your Practice** *Morilla* — 4 PM

Lectures

- **Dental Hygiene Lasers** *Cardoza, Riley,* ACC 209 A/B — 8 AM
- **Battling Biofilm and Inflammation*** *Wu,* ACC 303 A/B — 8 AM
- **Battling Biofilm and Inflammation*** *Wu,* ACC 303 A/B — Noon
- **Essential Core Oral Pathology** *Achterberg,* ACC 210 A/B — 9 AM
- **Prebiopsy Diagnostics** *Achterberg,* ACC 210 A/B — 1 PM
- **Restorative Materials Update 2014>** *Brucia,* ACC Ballroom E — 9 AM
- **>Restorative Materials Update 2014** *Brucia,* ACC Ballroom E — 1 PM
- **Oral Surgery/Pediatric Patient>** *Borris,* Hilton Pacific A — 9 AM
- **>Oral Surgery/Pediatric Patient** *Borris,* Hilton Pacific A — 1 PM
- **Smile Design, Interdisciplinary and Occlusal Update>** *Chiche,* ACC Ballroom B — 9 AM
- **>Smile Design, Interdisciplinary and Occlusal Update** *Chiche,* ACC Ballroom B — 1 PM
- **TMD Made Easy** *Spencer,* ACC 304 C/D — 9 AM
- **Sleep Apnea and Snoring** *Spencer,* ACC 304 C/D — 1 PM
- **Restorative and Whitening Products** *Osuna,* ACC 204 B — 9 AM
- **All Ceramic Restorations Etchable and Non-etchable>** *McLaren,* ACC 207 C/D — 9 AM
- **>All Ceramic Restorations Etchable and Non-etchable** *McLaren,* ACC 207 C/D — 1 PM
- **Eat Well, Live Well, Age Well** *Smith,* Hilton Pacific B — 9 AM
- **Building a Healthier You** *Smith,* Hilton Pacific B — 1 PM
- **Diagnosis/Treatment/Oral Trauma** *Soxman,* Hilton California B — 9 AM
- **Pediatric Alpha Pup** *Soxman,* Hilton California B — 1 PM
- **Functional Anterior Esthetics>** *Hooper,* ACC Ballroom A — 10 AM
- **>Functional Anterior Esthetics** *Hooper,* ACC Ballroom A — 2 PM
- **Life of a Top-gun Dental Team** *Hyman,* Hilton California D — 10 AM
- **Top Game Changers of 2014** *Hyman,* Hilton California D — 2 PM
- **Skills for Difficult Conversations** *Osborne,* ACC 208 A/B — 10 AM
- **Move Patients/Denial to Action** *Osborne,* ACC 208 A/B — 2 PM
- **Women's Oral Health – Part I** *Steinberg,* ACC Ballroom C/D — 10 AM
- **Women's Oral Health – Part II** *Steinberg,* ACC Ballroom C/D — 1 PM
- **What's Up With Whitening?** *Wallace,* ACC 209 A/B — 10 AM
- **Everyday Adhesives Tips** *Wallace,* ACC 209 A/B — 2 PM
- **CAMBRA** *Creasey,* ACC 204 B — 1 PM
- **Dental Electronic Health Records** *Uretz,* ACC 303 A/B — 2 PM
- **Colgate Corporate Forum – Diagnosis and Management of Dentin Hypersensitivity** *Li,* ACC 205 A/B — 3 PM
- **PPO Mastery** *Straine,* ACC 210 A/B — 3 PM

7 AM | 8 AM | 9 AM | 10 AM | 11 AM | Noon | 1 PM | 2 PM | 3 PM | 4 PM | 5 PM | 6 PM

CDA Presents schedule-at-a-glance

Friday, May 16, 2014

Anaheim Convention Center (ACC)
Hilton Anaheim Hotel
*Repeated Course >Continued Course

Friday Exhibit Hall Hours
9:30 a.m.—5:30 p.m.

Required Courses — Ticket Required

7 AM | 8 AM | 9 AM | 10 AM | 11 AM | Noon | 1 PM | 2 PM | 3 PM | 4 PM | 5 PM | 6 PM

- **California Dental Practice Act** *Curley,* ACC Ballroom C/D
- **Infection Control** *Arns,* ACC Ballroom C/D

The Spot — The Smart Dentist Series, Free Lectures in the Educational Theater

- **Art of Getting to "Yes"** *Hyman*
- **Regulatory Compliance** *Pichay*
- **Patient Reviews and Reputation Management** *McCollough*
- **Managing Patient Conflicts** *Alvi*
- **Wine FUNdamentals** Ticket required

Workshops — Ticket Required

- **Ultrasonic Technology*** *Wu,* ACC 210 C
- **Ultrasonic Technology*** *Wu,* ACC 210 C
- **Anterior and Posterior Etched Ceramic Restorations>** *McLaren,* ACC 213 B
- **>Anterior and Posterior Etched Ceramic Restorations** *McLaren,* ACC 213 B
- **Social Media and Online Marketing*** *Mele,* ACC 303 C/D
- **Social Media and Online Marketing*** *Mele,* ACC 303 C/D
- **Oral Biopsy Techniques – Cadaver*** *Achterberg, Paxton,* ACC 213 D
- **Oral Biopsy Techniques – Cadaver*** *Achterberg, Paxton,* ACC 213 D
- **TDIC Risk Management*** *Sahota, Weiss,* Hilton California A
- **TDIC Risk Management*** *Sahota, Weiss,* Hilton California A
- **Quality Panoramic and 3-D Images,*** *Johnson, et al* **Canceled**
- **Quality Panoramic and 3-D Images,*** *Johnson, et al* **Canceled**
- **Stainless Steel and Esthetic Crowns*** *Soxman,* ACC 213 A
- **Stainless Steel and Esthetic Crowns*** *Soxman,* ACC 213 A
- **Equipment Care and Repair** *Yaeger Sr. & Jr.,* ACC Exhibit Hall D
- **Guide to Suturing and Soft Tissue Management** *Borris,* ACC 210 C
- **Great Dental Photographs** *Henderson,* ACC Exhibit Hall D

Air Techniques Corporate Forum (C.E. Exhibit Floor Hall D)

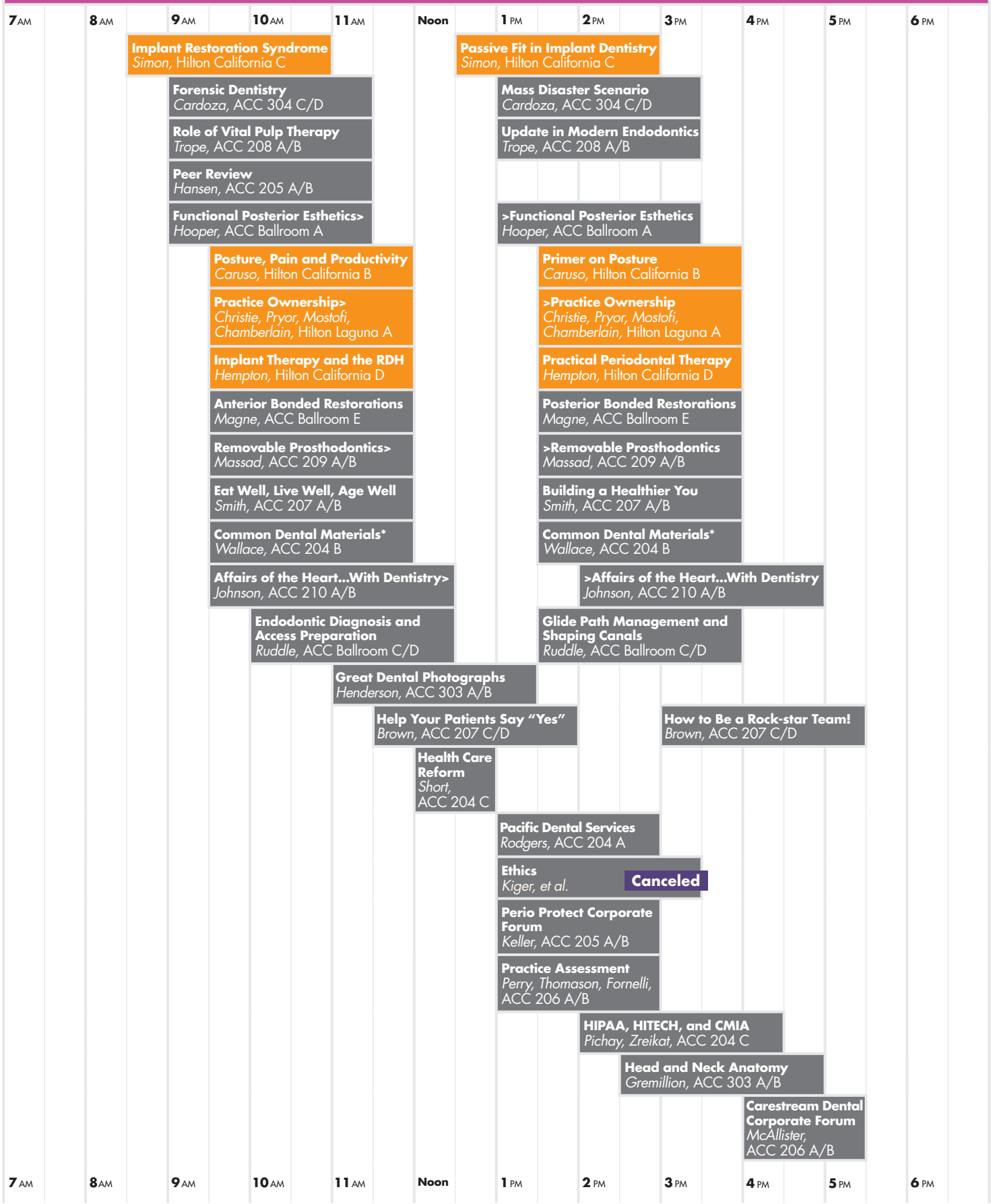
- **Instrument Processing** *Menage Bernie*
- **Caries Detection Abilities** *Jablow*
- **Imaging 2.0** *Kachalia*
- **EMPOWERing Your Practice** *Morilla*

Lectures

- **Dentoalveolar Surgery** *Borris,* ACC 207 C/D
- **CAMBRA** *Creasey,* ACC 303 A/B
- **Adult Denti-Cal Services** *Holloway, Murthy, Prabhu,* ACC 204 C
- **Posterior Bonded Porcelain>** *Brady,* ACC Ballroom B
- **>Posterior Bonded Porcelain** *Brady,* ACC Ballroom B
- **International Volunteer** *Serio, Rollofson,* ACC 206 A/B

7 AM | 8 AM | 9 AM | 10 AM | 11 AM | Noon | 1 PM | 2 PM | 3 PM | 4 PM | 5 PM | 6 PM

Lectures (continued)



CDA Presents schedule-at-a-glance

Saturday, May 17, 2014

Anaheim Convention Center (ACC)
Hilton Anaheim Hotel
*Repeated Course >Continued Course

Saturday Exhibit Hall Hours
9:30 a.m.—4:30 p.m.

Required Courses — Ticket Required

7AM | 8AM | 9AM | 10AM | 11AM | Noon | 1PM | 2PM | 3PM | 4PM | 5PM | 6PM

- **Infection Control** *Arns*, ACC Ballroom C/D
- **California Dental Practice Act** *Curley*, ACC Ballroom C/D

The Spot — The Smart Dentist Series, Free Lectures in the Educational Theater

- **How to Handle Negative Online Reviews** *Corum*
- **Manuals and Policies** *Thomason*
- **Characteristics of Ethical Dental Professionals** *Ryan*
- **Dental Benefits** *Milar*

Workshops — Ticket Required

- **Modern Endodontics: Theory to Practice*** *Trope*, ACC 213 A
- **Crown Lengthening>** *Hempton*, ACC 213 B
- **Team Fabulous!>** *Wallace*, ACC 303 C/D
- **Anatomy of the Masticatory System: Clinical App./Human Cadaver Dissection>** *Gremillion, Hawkins*, ACC 213 D
- **TDIC Risk Management** *Iwata, Weiss*, Hilton California A
- **Modern Endodontics: Theory to Practice*** *Trope*, ACC 213 A
- **>Crown Lengthening** *Hempton*, ACC 213 B
- **>Team Fabulous!** *Wallace*, ACC 303 C/D
- **>Anatomy of the Masticatory System: Clinical App./Human Cadaver Dissection** *Gremillion, Hawkins*, ACC 213 D
- **Great Dental Photographs** *Henderson*, ACC Exhibit Hall D

International Symposia of Dental Learning

- **New Restorative Strategies in Pediatric Dentistry – Part I** *Krämer*, ACC 204 C
- **New Restorative Strategies in Pediatric Dentistry – Part II** *Krämer*, ACC 204 C

Air Techniques Corporate Forum (C.E. Exhibit Floor Hall D)

- **Digital Imaging Diagnostics** *Jablow*
- **Digital Diagnostics** *Kachalia*
- **Environmental Surface Management** *Menage Bernie*
- **EMPOWERing Your Practice** *Morilla*

Lectures

- **Treating Back and Neck Pain** *Caruso*, ACC 304 C/D
- **Optimal Aging — Living to 100** *Steinberg*, ACC Ballroom A
- **Strategic Exit: Succession Planning for Dentists** *Fornelli, Oromchian, Murphy*, ACC 207 A/B
- **Top Tips for Clinical Success** *Brady*, ACC Ballroom B
- **Fitness & Function in Dentistry** *Caruso*, ACC 304 C/D
- **The Four "S's" of Optimal Aging** *Steinberg*, ACC Ballroom A
- **Anterior Esthetic Techniques and Materials** *Brady*, ACC Ballroom B

7AM | 8AM | 9AM | 10AM | 11AM | Noon | 1PM | 2PM | 3PM | 4PM | 5PM | 6PM

Lectures (continued)

7 AM | 8 AM | 9 AM | 10 AM | 11 AM | Noon | 1 PM | 2 PM | 3 PM | 4 PM | 5 PM | 6 PM

Overview of Contemporary Forensic Dentistry
Cardoza, Hilton California C

Orthodontic Care, Recognition and Treatment>
Dugoni, ACC 210 A/B

3-D Disinfection and Filling Root Canal Systems
Ruddle, Hilton Pacific C

Clinical Techniques in Pediatrics
Soxman, ACC 206 A/B

Capsulitis, Trismus and Disc Displacements
Spencer, ACC 204 B

To Polish or Not to Polish?
Wu, ACC 208 A/B

Recreational Drugs: Windows Into Our Brains?>
Johnson, Hilton California D

Great Dental Photographs
Henderson, ACC 205 A/B

A 360° Slam Dunk Guide for Successful Teams
Hyman, Hilton California B

How to Be a Rock-star Team!
Brown, ACC 207 C/D

Update on Preventive and Infection Products
Osuna, ACC 303 A/B

Periodontal and Implant Procedures*
Pasquinelli, ACC Ballroom E

Preparing Your Dental Practice for the Changes Ahead
Perry, ACC 209 A/B

Sleep Prosthodontics*
Rouse, Hilton Pacific D

>Orthodontic Care, Recognition and Treatment
Dugoni, ACC 210 A/B

Endodontic Nonsurgical Treatment
Ruddle, Hilton Pacific C

Hold 'Em or Fold 'Em?
Soxman, ACC 206 A/B

Management of Sleep Apnea and Snoring
Spencer, ACC 204 B

Grassroots Dental Hygiene
Wu, ACC 208 A/B

>Recreational Drugs: Windows Into Our Brains?
Johnson, Hilton California D

The Grand-slam Early Years of Private Practice
Hyman, Hilton California B

Help Your Patients Say "Yes"
Brown, ACC 207 C/D

Periodontal and Implant Procedures*
Brucia, Pasquinelli, ACC Ballroom E

Sleep Prosthodontics*
Rouse, Hilton Pacific D

Restorative Sciences: A USC Program
Duarte, et al., ACC 205 A/B

Cal/OSHA Refresher
Arns, ACC Ballroom C/D

Maximizing Social Media – Minimize Risks
Mostofi, Tsai, ACC 207 A/B

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CDA JOURNAL, VOL 42, N°5

The Effect of Nutrition on Periodontal Disease: A Systematic Review

Varun Kulkarni, BDS; Neel B. Bhatavadekar, BDS, MS, MPH; and Juhi Raju Uttamani, BDS

ABSTRACT The link between nutrients and periodontal disease has not been clearly established. A PubMed and Cochrane database literature search was conducted. The published research reveals only a possible relationship between vitamins and minerals and periodontal disease. Vitamin E, zinc, lycopene and vitamin B complex may have useful adjunct benefits. However, there is inadequate evidence to link the nutritional status of the host to periodontal inflammation. More randomized controlled trials are needed to explore this association.

AUTHORS

Varun Kulkarni, BDS, is a general dentist at Patil's Dental Care Clinic in Mumbai, India.
Conflict of Interest Disclosure: None reported.

Neel B. Bhatavadekar, BDS, MS, MPH, is board-certified periodontist at the Dental Specialty Clinic, Bombay Hospital in Mumbai. He is an adjunct faculty member at the University of North Carolina, Chapel Hill, and the University of Texas Health Science Center in Houston. He is a diplomate of the American Board of Periodontology and a fellow of the International Team for Implantology.
Conflict of Interest Disclosure: None reported.

Juhi Raju Uttamani, BDS, is a research associate in the Department of Periodontology at the University of Illinois at Chicago College of Dentistry.
Conflict of Interest Disclosure: None reported.

Periodontitis is defined as an inflammatory disease of the tooth-supporting tissues caused by groups of specific microorganisms, resulting in the progressive destruction of the periodontal ligament and alveolar bone with periodontal pocket formation, gingival recession or both.[1] Dental plaque biofilm is the primary etiology of periodontal disease and is composed of bacteria and toxins found in the plaque and calculus that builds up around the teeth. Gram-negative bacteria within the dental plaque elicit an inflammatory response, which results in the breakdown of the connective tissue surrounding the teeth.[2,3] While bacteria are the causative agents for various diseases, many scientists believe that systemic host response and the immune system are the actual determinants of any disease.[4]

Periodontal disease is the result of an inflammatory response resulting from the interaction between pathogenic bacteria and the host's immune response.[5,6] As a result of stimulation from bacterial antigens, polymorphonuclear leukocytes (PMN) produce reactive oxygen species (ROS) during phagocytosis as part of the host response to infection. This exacerbates the oxidative damage to the gingival tissue, periodontal ligament and the alveolar bone.[4] Antioxidants are defined as molecules capable of slowing or preventing the oxidation of other molecules.[4] Oxidation is a chemical reaction that transfers electrons from a substance to an oxidizing agent. Data suggest that there are mechanisms in which nutrition, particularly antioxidants, can influence the periodontal disease onset, progression

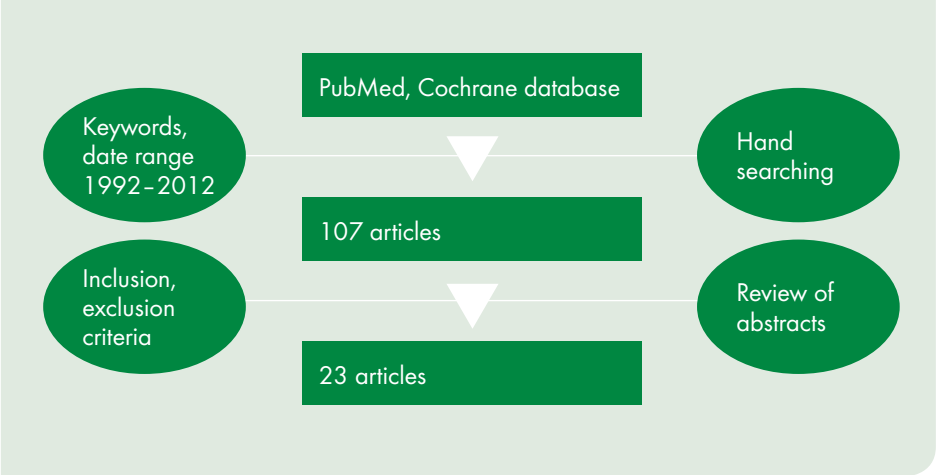

FIGURE 1. Screening protocol.

and wound healing. [5,7,8] The following literature review summarizes studies exploring the potential benefits, if any, of daily dietary nutrients in periodontally compromised patients.[9]

To the best of the authors' knowledge, there is no such systematic review available that assesses studies over a broad period. This paper seeks to fill that void and tries to answer two clinically relevant questions: Is there conclusive evidence regarding the beneficial effects of dietary nutritional intake in the prevention and treatment of periodontal disease? And if yes, which nutrients are recommended as adjuncts to the periodontal treatment?

Methods and Materials

A literature search was conducted using Medline (PubMed), Cochrane database and an online search using Google Scholar and the following search words, using Boolean operators: nutrition, nutritional supplements, periodontal disease, periodontitis, gingivitis, malnutrition and vitamin deficiency. The types of articles were limited to meta-analyses, reviews, clinical trials and randomized controlled trials (RCTs). The date range was Jan. 1, 1992, to Jan. 1, 2012. The authors reviewed the literature separately and any conflict in terms of article inclusion was resolved with discussion.

Inclusion Criteria: Articles included were categorized as meta-analyses, reviews, clinical trials and RCTs (**FIGURE 1**). Review articles were tabulated in a separate table, but excluded from the systematic review analysis.

Exclusion Criteria: Articles not meeting the inclusion criteria were excluded. In addition, articles focusing on maternal and prenatal conditions, such as preeclampsia, and the influence on periodontitis of systemic diseases like HIV/AIDS, diabetes mellitus, aspiration pneumonia and cardiovascular diseases were excluded. Lastly, articles that focused on prosthetic therapy (e.g., dentures), caries and gangrenous infections (e.g., Noma) were excluded from the final analysis.

Results: Per the preliminary inclusion criteria, 107 studies were selected. Of those, 23 articles were further shortlisted according to their subject relevance based on detailed assessment of the study abstracts. From these 23 articles, six met the criterion of being clinical trials or RCTs and were included in **TABLE 1**. However, for completeness, **TABLE 2** includes meta-analyses and review articles, although these do not fall within the purview of this systematic review.

Among the relevant articles (**TABLE 1**), the following nutritional components amassed the greatest amount of research.

Antioxidants as Modulators of Inflammation

Antioxidants are natural substances that exist as vitamins, minerals and other compounds in foods. They are believed to help prevent disease by resisting free radicals.[7] Free radicals are formed by normal bodily processes, such as breathing, and by environmental contaminants, such as cigarette smoke.[7,8] If the amounts of antioxidants are inadequate, these free radicals travel throughout the body damaging cells. There are various extracellular antioxidants, such as lycopene, vitamin E, vitamin C, carotenoids, glutathione, iron and copper, to name a few.

Lycopene: Lycopene, which belongs to the family of carotenoids, is a powerful antioxidant that is almost twice as powerful as beta-carotene, and is found in tomatoes and pink grapefruit. A few observational studies suggest that lycopene may help prevent macular degeneration, cataracts, cardiovascular disease and cancer.[10-19] Furthermore, lycopene has shown promising results in the treatment of leukoplakia.[20] Much weaker evidence exists for treating conditions such as prostate cancer,[21,22] male infertility[23] and sunburn.[24] There has been only one double-blind, placebo-controlled study on lycopene, which concluded that it may be helpful in the treatment of periodontal disease, whether taken alone or used to augment the effectiveness of conventional procedures, such as scaling and root planing (SRP).[25] Hence the effect of lycopene on periodontal disease is still in question. More RCTs, clinical trials and double-blind placebo-controlled studies are needed to explore this association in detail.

Vitamin E: The main function of vitamin E is to stabilize the membrane structure by terminating the free radical chain reaction.[26] Vitamin E is found in

TABLE 1

Nonreview Research Studies

Author Name	Type of Study	Sample Size	Findings	Periodontal Findings
Meisel P, Schwahn C, Luedemann J, John U, Kroemer HK, Kocher T[69]	Controlled clinical trial	Cross-sectional epidemiological investigation involving 4,290 subjects aged 20 to 80 years, in which 60 subjects using oral magnesium-containing drugs and 120 subjects not using the same, were compared.	Nutritional magnesium supplementation may improve periodontal health; however, more research is needed.	Subjects taking magnesium drugs showed less attachment loss, lesser probing depth and more remaining teeth than the subjects not taking magnesium, suggesting the beneficial role of magnesium in periodontal health.
Dixon D, Hildebolt CF, Miley DD, Garcia MN, Pilgram TK, Couture R, Anderson Spearie C, Civitelli R[3]	Clinical trial	228 patients.	Knowledge of the benefits of supplementation needs to be better disseminated and research needs to be conducted to determine optimal levels of calcium and vitamin D supplementation.	In the trial, exact levels of calcium and vitamin D dosage for the patients with periodontal disease are unknown. Self-reported intake levels would be insufficient by themselves to prevent deficiencies and stabilize periodontal health.
Jenzsch A, Eick S, Rassoul F, Purschwitz R, Jentsch H[79]	Clinical trial	20 female subjects with metabolic syndrome and mild-to-moderate chronic periodontitis.	In patients with metabolic syndrome, wholesome nutrition might reduce inflammatory variables of periodontal disease and promote periodontal health.	After 12 months, significant reduction of clinical probing depth, gingival inflammation and concentrations of IL-1β as well as IL-6 (in gingival crevicular fluid) were noted.
Willershausen B, Ross A, Försch M, Willershausen I, Mohaupt P, Callaway A[77]	Randomized controlled trial	40 healthy students (28 female, 12 male) experiencing high examination stress.	Micronutrients, taken during periods of high stress, had a beneficial effect on inflammatory processes.	The pilot study showed that micro-nutrients, taken during periods of high stress, had a beneficial effect on gingival inflammatory processes (slightly lower mean SBI) and reduced levels of some of the plasma lipids in males.
Harpenau LA, Cheema AT, Zingale JA, Chambers DW, Lundergan WP[42]	Randomized controlled trial	85 patients (50 male, 35 female), 40 received the test supplement and 45 received a placebo.	The trial tested the effect of a nutritional supplement on gingival inflammation, bleeding, probing depth, clinical attachment level, carotenoid antioxidant level and C-reactive protein.	The supplement consisting of a standard multivitamin formula, with several phytonutrients associated with anti-inflammatory/antioxidant effects, provided modest benefits in reducing gingival inflammation, bleeding, probing depth and clinical attachment levels.
Muñoz CA, Kiger RD, Stephens JA, Kim J, Wilson AC[63]	Randomized controlled trial	63 patients were randomly divided into two groups of 32 and 31 and given either a vitamin tablet containing seven active ingredients (experimental treatment) or a placebo tablet.	A multivitamin nutritional supplement might be a beneficial adjunct to the required established periodontal treatment (scaling and root planing).	At the end of the study, various periodontal symptoms, such as bleeding and recurrence of gingivitis, were reduced for participants who were taking the multivitamin supplement.

noncitrus fruits, nuts[27] and seeds. Slade et al.[26] assessed vitamin E levels in patients with and without periodontal disease and found no significant difference in the levels of serum vitamin E between these two groups. Similarly, a 1991 study published in *Clinical Preventive Dentistry*[28] compared the use of a vitamin E gel, a chlorhexidine rinse and a placebo for treating periodontal disease. These results did not support the use of vitamin E as a topical chemotherapeutic agent for the control of gingivitis or periodontal disease. Subjects using the chlorhexidine rinse had a reduction in plaque.[28] However, a recent study has shown periodontal patients to have lower vitamin E levels as compared with healthy subjects, possibly indicating a mitigating effect of vitamin E on periodontal inflammation and collagen breakdown.[29]

Vitamin C: Vitamin C, or ascorbic acid, is a powerful antioxidant associated with maintaining cell health, particularly in

TABLE 2

Review Articles and Meta-Analyses

Author Name	Type of Study	Findings
Ritchie CS, Joshipura K, Hung HC, Douglass CW[8]	Meta-analyses	This study addresses the relationship between oral health and nutrition.
Van der Velden U, Kuzmanova D, Chapple IL[34]	Review	Current evidence is insufficient to support recommendations of mono-antioxidant vitamin supplements and randomized controlled double-blind intervention studies are needed to provide evidence to underpin future recommendations. Inadequate supply of vitamin D and calcium may be addressed by implementing changes in diet/lifestyle or by supplements.
Chapple IL[9]	Review	Nutritional intervention studies in patients with inflammatory periodontitis are needed to evaluate the effect of nutritional approaches to periodontal management.
Enwonwu CO, Ritchie CS[74]	Review	Some nutrients play a direct role in the resolution of inflammation. These relationships necessitate consideration of the adjunctive role of diet in the natural history of periodontitis.
Enwonwu CO, Phillips RS, Ibrahim CD, Danfillo IS[5]	Review	Inflammatory oral diseases resulting from inappropriate interactions between microorganisms and the malnourished, immune-compromised host have continued to pose serious health problems in African countries.
Bsoul SA, Terezhalmy GT[73]	Review	Special attention with respect to vitamin C is required in patients with periodontal disease, smokers, pregnant and lactating women and the elderly.
Neiva RF, Steigenga J, Al-Shammari KF, Wang HL[38]	Review	Association between nutritional elements/supplements and periodontal status, and others have reported possible positive influences of nutritional supplementation on periodontal therapeutic outcomes.
Boyd LD, Madden TE[83]	Review	Even though nutrition is not recognized as a risk factor for periodontal diseases, it is acknowledged to have a significant impact on optimal functioning of the immune response.
Boyd LD, Lampi KJ[80]	Review	Nutrition is one of the modifiable factors that affect the host's immune response and the integrity of the hard and soft tissues of the oral cavity. Nutritional counseling from the dentist is very important.
Enwonwu CO, Phillips RS, Falkler WA Jr.[6]	Review	Malnutrition can intensify the severity of oral infections and may lead to their evolution into life-threatening diseases.
Dorsky R[81]	Review	The link between nutrition and oral health exists. Dentists can provide nutrition counseling and point out reputable sources of nutrient supplements for their patients.
Sculley DV, Langley-Evans SC[78]	Review	Research has found reduced salivary antioxidant activity in patients suffering from periodontal disease. An improved understanding of the role antioxidants play in periodontitis, and the influence of nutrition on antioxidant status, may lead to a possible nutritional strategy for the treatment of periodontal disease.
Hornick B[85]	Review	Collaboration between dietetics professionals and oral health care professionals is essential in identifying, educating and treating oral health problems related to nutrition.
Enwonwu CO[82]	Review	Malnutrition, particularly of the protein-energy type that involves concomitant deficiencies of several nutrients, impairs production of cytokines, diminishes acute-phase protein response to infections, thus increasing the severity of inflammatory periodontal conditions.
Enwonwu CO[75]	Review	Malnutrition elicits adverse alterations in the oral microbial ecology and in the volume and the antibacterial and physicochemical properties of saliva. Therefore, it has the potential to adversely influence the prognosis of periodontal infections.
Johnson NW, Curtis MA[72]	Review	Improvement of general health and resistance to disease with proper nutrition, smoking cessation and lowering stress-induced risk are encouraged for prevention of periodontal diseases.
Karp WB[84]	Review	Discussion of the latest nutrition recommendations put forth by major U.S. health organizations and comments on their applicability to dental patients.

connective tissue such as the periodontium, and is involved in immunological functions, such as phagocytosis, and in wound healing. Studies indicate a relationship between plasma vitamin C and inflammation.[30,31] One study on ascorbic acid that looked at low dietary intake and incidence of periodontitis in a smoking population suggested that ascorbic acid may influence crevicular bleeding.[31] The consumption of grapefruit has been shown to improve the vitamin C supply in patients with periodontitis and to decrease the sulcus bleeding index (mSBI).[32] However, there is no study showing that vitamin C intake as an adjunct to conventional therapy such as SRP yielded better results compared to SRP therapy alone.

Vitamin D: Vitamin D is essential for cell development, neuromuscular functioning, bone development and inflammation control. In a cross-sectional study, Miley et al. found improved periodontal health with vitamin D intake from food and supplements in patients with chronic periodontitis and suggested that low dietary intake of vitamin D had a noticeable effect on bone loss. Low dietary intake of vitamin D may also impact the inflammatory action and antimicrobial effects in periodontal disease.[33] Van der Velden et al. suggested including vitamin D at the higher end of the daily recommended allowance for the treatment and prevention of periodontitis.[34] The relationship between alveolar bone density and tooth loss has also been noted and suggests that low bone density may be a risk factor for periodontal disease.[35-37]

Vitamin B Complex: Vitamin B complex is necessary for cell growth and metabolism. Neiva et al.[38] highlighted the positive role of nutrients in periodontal status and wound healing. A longitudinal study has shown a relationship between tooth loss and a reduced consumption of fruits and vegetables containing vital nutrients such as vitamin B complex.[39] Reduced intake of vegetables, fish and shellfish rich in vitamin B complex and other nutrients was related to a lower number of teeth in elderly Japanese people.[40] Meat and poultry products such as chicken, eggs, beef, lamb and pork are relatively rich sources of riboflavin, niacin, pantothenic acid and biotin, but are low in pyridoxine and thiamine.[41] The other B vitamins are found in cereals and whole grains (B1, B2 and B3), green leafy vegetables (B2 and B9), eggs (B7 and B12), chicken (B3, B6 and B12), citrus fruits (B9), nuts (B3 and B9) and bananas (B6 and B7). In our systematic review, we found that the data were quite heterogeneous regarding vitamin B supplements and their potential beneficial effects in the treatment of periodontal disease. Hence, more longitudinal cohort studies and follow-up randomized controlled trials are needed to determine the efficacy of vitamin B complex in the prevention and treatment of periodontal disease.

The data were quite heterogeneous regarding vitamin B supplements and their potential beneficial effects in the treatment of periodontal disease.

Carotenoids: Carotenoids, radical trapping antioxidants, have shown modest results in controlling inflammation.[42] Alpha-carotene is found in root vegetables such as carrots. Green leafy, root and fruiting vegetables are beta-carotene sources.[27] A study on Papillon-Lefèvre syndrome, which included systemic carotenoid medication, showed no positive effect on the subjects' periodontal health.[43] The use of topical tretinoin acid gel showed a 50 percent reduction in controlling oral leukoplakia. However, further studies are needed to establish the appropriate indication and its efficacy.[44] A pilot study on the treatment of oral lichen planus with 13-cis-retinoic acid (isotretinoin) reported beneficial effects on the damaged cells' apoptotic process.[45]

Another study has shown that beta carotenoid supplementation significantly reduced micronucleated exfoliated cell frequency in atrophic and erosive oral lichen planus.[46] However, its positive use in periodontal diseases has yet to be evaluated in detail.

Reduced Glutathione: It is noteworthy that chronic periodontitis patients have been shown to have low levels of the protective antioxidant glutathione.[47] Glutathione might be beneficial when used as a supplement to help prevent chronic periodontitis and might enhance tissue healing.[48] Reduced glutathione serves as an antioxidant and modulator of inflammation by blocking the proinflammatory cytokine production.[49] Studies have also demonstrated that pathogens cause cytokine-related tissue damage by preventing the formation of reduced glutathione through degradation of cytosine.[48,49]

Copper: Copper is essential for proper connective tissue development. The role of copper in the inflammatory response is a possible link because inflammation is a characteristic of periodontal disease.[50] In a research article, copper ions played a significant role in restricting the colonies of *Porphyromonas gingivalis* present in the sulcus by adhesion and accumulation of salivary and serum proteins. This in turn inhibited the coaggregation

and hemagglutination of *P. gingivalis*.[51] Vitamin C, zinc and copper deficiencies increase the susceptibility to infection, impair the function of neutrophils and macrophages, reduce antibody-mediated phagocytic, cell-mediated phagocytic and delayed-type hypersensitivity reactions and depletion of antioxidants.

Zinc: The zinc cation exhibits antimicrobial activity by constraining glycolysis of the bacterial proteases.[52] Zinc acts like an immunity booster and improves wound healing. Because zinc ions reduce oral malodor, it is commonly added to toothpastes and mouthwashes in the form of 0.2% zinc sulfate.[52,53] Zinc citrate significantly reduces plaque accumulation.[54] Triclosan, when combined with zinc citrate, shows improved substantivity and reduction in the unwanted side effects of other compounds in the dentifrice. Zinc is found in tea, cranberries and beer. The highest concentration is found in red chicory, raspberries and mushrooms.[52] The metabolic activity of zinc phenolsulphonate on plaque may reduce its growth, thus helping to mitigate the effects of periodontitis.[55]

Iron: Iron plays a vital role in oxygen binding as a component of hemoglobin in red blood cells. It is also a constituent of several enzymes in the body and the electron transport chain. Iron acts as an antioxidant via specific enzymes, such as catalase and peroxidase. Excess iron in the tissues results in the formation of free radicals and can lead to organ damage.[56] Its growth is seen in the production of iron-binding compounds such as ferritin, haemin, lactoferrin and transferrin.[57] Berlutti et al. suggested the role of iron in aggregation and biofilm formation of *Streptococcus mutans*.[58] Similarly, Johnson et al. demonstrated the ability of *Staphylococcus aureus* to form biofilm under low-iron conditions.[59] Sorghum,[60] iron-fortified cereals,[61] red meat (especially beef), oysters, fish such as salmon and tuna and whole grains [62] are rich sources of iron.

Calcium: Calcium deficiency is related to periodontal bone loss and osteoporosis, while optimum levels of calcium enhance periodontal health.[38] However, a recent paper [63] considered the possible clinical implication of osteoporosis in the management of periodontal disease, and concluded that the current knowledge regarding the effects of osteoporosis/osteopenia on periodontal disease and alveolar bone loss is inadequate. Studies have shown that increased dairy intake of calcium may be associated with a lower prevalence of periodontal disease.[64] Calcium intake below the recommended value is associated with tooth loss.[63,64] One survey conducted on young males and females (aged 20 to 39) and older males (aged 40 to 59) concluded that low dietary intake of calcium resulted in more severe periodontal disease.[65] However, it also noted that calcium deficiency alone cannot account for destruction of the alveolar bone in periodontal disease.[66,67] In a case-control study of two groups of 27 gingivitis-affected and unaffected females between the ages of 17 and 19, dietary measures such as milk consumption showed a correlation with healthy gingival status.[68]

Magnesium nutritional supplementation has been documented to improve periodontal health in patients with chronic periodontitis.

Magnesium: In a cross-sectional study, Meisel et al.[69] found a relationship between magnesium and periodontal disease. Increased serum magnesium and calcium levels caused decreased probing depth and lesser attachment loss.[69] Tanaka et al. suggested that the intake of magnesium is associated with reduced incidence of tooth loss in pregnant Japanese women, while calcium, phosphate, iron, zinc and copper had no effect.[70] Ford and Mokdad recommend a greater focus on increasing dietary magnesium intake in the United States, due to its beneficial effects.[71] Green vegetables, nuts, seeds, dried beans, whole grains and meats are good food sources of magnesium.[71]

Discussion

Nutrition and Periodontal Health

Local and systemic factors affect the severity and progression of periodontal disease. Some studies have reported that vitamin C and calcium deficiencies cause periodontal disease.[30,65] Smokers with low dietary vitamin C are at an increased risk for periodontal disease.[72,73] Magnesium nutritional supplementation has been documented to improve periodontal health in patients with chronic periodontitis.[69] The fact that vitamin E helps to alleviate periodontal inflammation calls for its incorporation in our daily diet.[29]

We found many studies that attempted to link dietary nutrition intake and periodontal disease.[42] Though the role of vitamin B complex in periodontal disease has not been explored extensively, its positive effect in periodontal wound healing, as well as its relationship to tooth loss, has been reported.[38,39] Clinical trial results imply that multivitamin nutritional supplementation showed clinically significant improvements in gingival index and periodontal pocket depth and

might act as an adjunct to periodontal treatment.[63,42] Malnutrition elicits adverse alterations in the oral microbial ecology, as well as in the volume and the antibacterial and physicochemical properties of saliva.[37] A diet lacking in nutrients consistently impairs innate and adaptive defense of the host, including phagocytic function, cell-mediated immunity, complement system, secretory antibody, as well as cytokine production and its function.[30] Zinc, which is well known as an immunity booster, also has beneficial effects in reducing plaque accumulation and should be incorporated in the diet.[52,54] It has been noted that in patients with metabolic syndrome and chronic periodontitis, a healthy diet reduced inflammation in periodontal disease and promoted periodontal health.[79]

Effects of Malnutrition

The goal of nutritional support in periodontal disease should be to provide adequate energy and nutrients to meet the increased requirements for synthesis of acute phase proteins, inflammatory mediators, antioxidant defenses and the promotion of tissue repair and restoration of cellular function.[61] Nutritional deficiency reduces the host's ability to launch an adequate inflammatory response.[30] We can safely conclude that a healthy diet and removal of the microbial biofilm will reduce the severity of periodontal disease and improve the outcome of treatment.[74,75] IFNγ, TGF-beta and IL-1Ra are the factors necessary for the healing phase which are compromised in malnutrition.[38,30] Balanced nutrition is an adjunct in dealing with the severity of periodontal disease. It also promotes healing; however, it is imperative that the chronic inflammatory stimuli from dental plaque be removed.[30]

Some studies have explored the cytokine networks involved in chronic periodontitis.[74,75] Protein energy malnutrition remarkably reduces the ability to produce cytokines, leading to poor prognosis in these patients.[75] In periodontal disease, episodes of healing along with episodes of tissue destruction are seen.[14]

Acute phase response is a reaction to tissue injury that results in an increased peripheral leukocyte count, alteration in hepatic proteins, fever and hormonal changes.[76] We have also learned that severely malnourished children can have an acute phase response to periodontal disease.[30,77] In a study by Willershausen et al., daily dietary supplementation of micronutrients showed some improvement in gingival inflammation in periods of high stress.[77]

In malnutrition, there is a tissue depletion of the essential nutrients that act as antioxidants.[78] Cellular depletion of antioxidant nutrients promotes immunosuppression, accelerated replication rate of ribonucleic acid viruses and increased disease progression. Therefore, malnutrition can intensify the severity of oral infections.[6,79]

Conclusion

We found a complex relation between the nutritional status of the host and the inflammatory component of periodontal disease.[80-83] Based on the evidence and heterogeneous data, and keeping in mind the two questions we sought to answer in this review, we conclude that there is limited evidence to prove that nutrients derived from daily dietary intake can be used as an adjunct to periodontal treatment. However, it is important to ensure that patients do not suffer from a specific nutritional deficiency. Lastly, we acknowledge that good nutrition is of very limited value if the chronic inflammatory stimuli from the dental plaque biofilm is not removed.[84,85] ■

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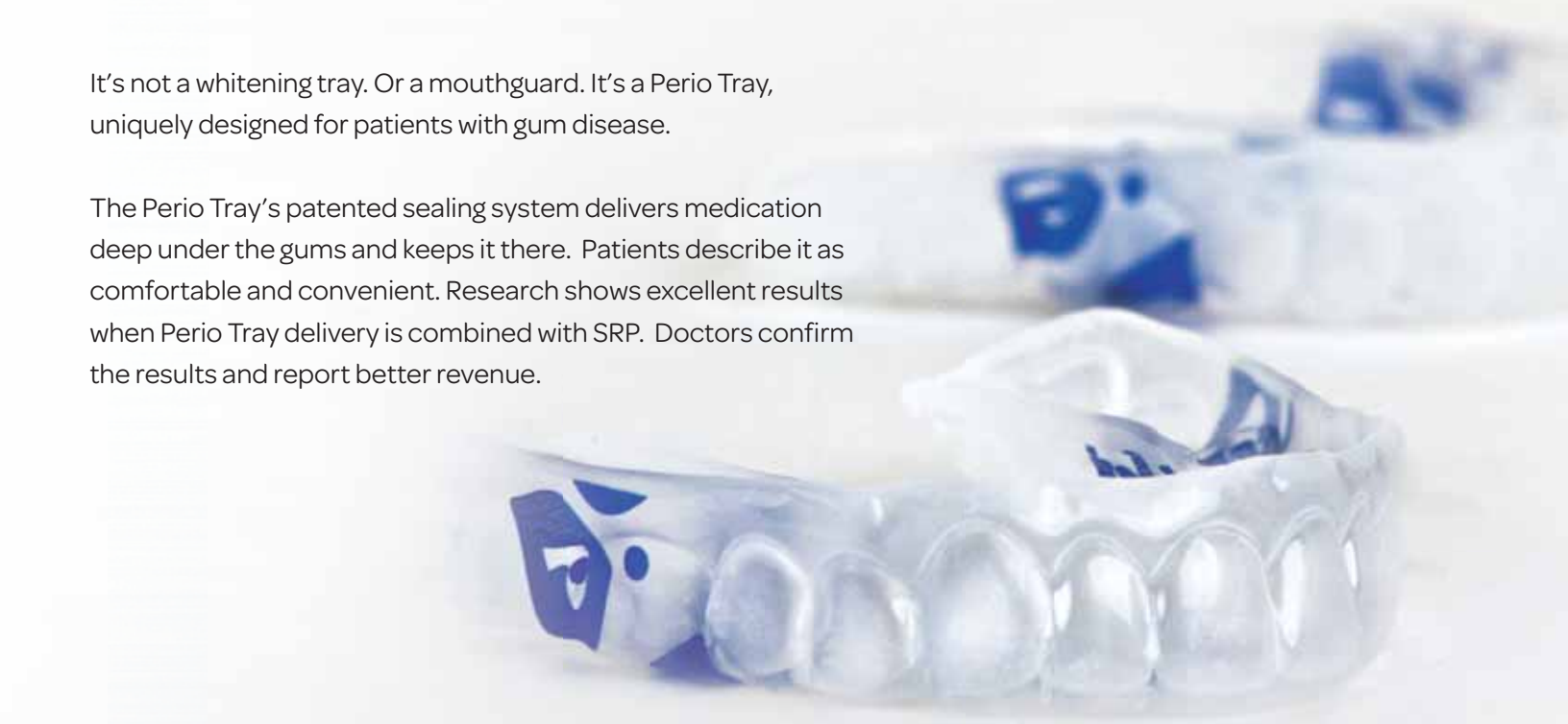

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CDA JOURNAL, VOL 42, N°5

Restorative and Periodontal Challenges in Adults with Dystrophic Epidermolysis Bullosa

Divya Puliyel, BDS; Ching Hsiu Ketty Chiu, DDS, MS; and Mina Habibian, DMD, MS, PhD

ABSTRACT Oral manifestations of dystrophic epidermolysis bullosa (DEB) include blistering of the oral mucosa, scarring, limited mouth opening, decreased mobility of the tongue, restrictions in oral functions and a high incidence of caries. Adult oral health management is challenging and requires unique strategies, which have not been well described in the published literature. We present a case of DEB focusing on the obstacles encountered during restorative and periodontal care and recommendations for appropriate treatment.

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Dystrophic epidermolysis bullosa (DEB) is characterized by cutaneous and mucosal fragility following minor trauma. This leads to the formation of blisters and superficial ulcerations that heal with significant scarring.[1,2] The most recent DEB classification system includes the subtypes recessive DEB, severe generalized (RDEB-SG); recessive DEB, generalized other (RDEB-O); and dominant DEB (DDEB).[3] The incidence of DDEB in the United States is three per million live births, and for RDEB it is two per million live births.[4] Onset is usually at birth, but delayed presentations are also reported.[5] The diagnosis of DEB is made primarily by history and clinical presentation. Nevertheless, a biopsy of a vesicle and adjacent normal tissue is recommended to confirm the diagnosis. Histologically there is a separation of the sublamina dura due to blistering below the lamina densa of the basement membrane.[6]

Individuals with RDEB typically have extensive ulcerations of their oral mucosa that heal with scarring and eventually alter the oral architecture. Patients may present with multiple carious lesions, extensive gingival inflammation, ankyloglossia, microstomia and obliteration of the oral vestibule. DEB patients are also at a higher risk for oral and skin squamous cell carcinomas (SCC).[7-9]

Children with this condition who are managed by a comprehensive medical and dental team receive supportive treatment and preventive dental care. The transition to adult oral health services is often delayed or denied due to the limited

FIGURE 1. Patient's lower back showing scattered regions of hypo- and hyperpigmentation along with exposed areas of ulceration. The patient did not use a bandage to cover the lesion.

FIGURE 2. Dystrophic fingernails on both hands.

FIGURE 3. Complete depapillation of the tongue. Note the ulceration at the corners of the mouth.

FIGURE 4. Erosive lesions on the buccal mucosa and an overlying fibrinopurulent membrane.

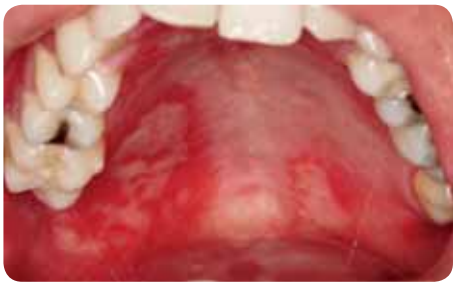

FIGURE 5. Hard palate showing extensive areas of ulceration extending to the soft palate.

FIGURE 6. Obliteration of the anterior labial mucobuccal fold. The image was taken after dental prophylaxis.

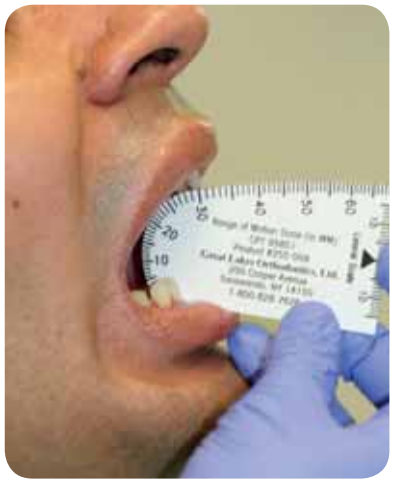

FIGURE 7. Maximum mouth opening measured to be 30 mm.

number of dentists who provide treatment for this population. Delays in regular follow up can substantially increase the incidence of dental caries and periodontal pathology.[10] The intent of this article is to increase the awareness and understanding of this condition and provide a description of the challenges encountered and treatment modifications that are required so adult patients with DEB can access care in a dental-office setting.

Case Report

A 21-year-old male presented to the Special Patients Clinic for routine comprehensive dental evaluation. He was not in acute pain or discomfort. He had received regular dental treatment and follow-up care with a pediatric dentist until he was age 18 and had since been trying to find a dentist experienced in managing adults with DEB. He had seen an oral surgeon for extraction of his impacted upper right wisdom tooth six months prior to his visit at our clinic. The procedure was done under intravenous sedation.

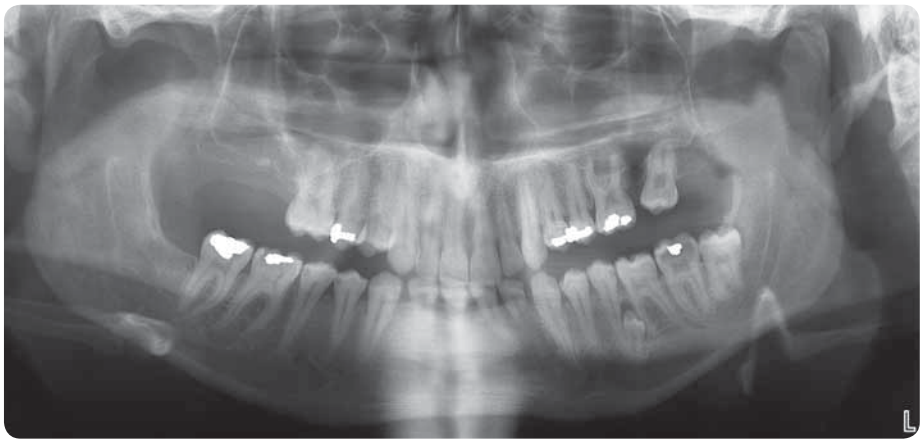

FIGURE 8. Panoramic radiograph showing multiple carious lesions. Note a supernumerary tooth impacted interdentally between the lower left second premolar and first molar.

His medical history included the diagnosis of RDEB-O, and he was under the care of a dermatologist. He was well nourished and of normal weight and height. The skin overlying his lower legs, the back of his neck and his lower back had areas of ulcerations, crusting and scattered hypo- and hyperpigmented scars (**FIGURE 1**). Both hands had dystrophic nails (**FIGURE 2**). The mobility of his fingers was minimally restricted due to the presence of contractures. He had had two esophageal dilations. At the time of presentation, he did not report difficulty with swallowing or spontaneous gagging. The patient was able to maintain adequate food intake, though primarily food of a soft consistency. He previously had recurrent problems with lacrimal duct blockage in both eyes that required multiple duct stenting. His current medications included multivitamins and iron supplements. He was using Aquaphor cream and topical nonstick bandages to manage his skin lesions.

Soft Tissue Examination

Intraoral mucosal findings included complete depapillation of the tongue with areas of ulceration covered with a fibrinopurulent membrane (**FIGURE 3**). The patient had difficulty raising his tongue to his palate. Mildly painful ulcerations were also present bilaterally on the buccal and labial mucosa (**FIGURE 4**), as well as the hard and soft palates (**FIGURE 5**). Palatal rugae were absent. The upper posterior and lower anterior mucobuccal folds were obliterated (**FIGURE 6**). Sclerotic bands could be palpated along the buccal mucosa bilaterally. The patient's maximum mouth opening was measured to be 30 mm (**FIGURE 7**).

Full-mouth periodontal charting was completed. Pocket depths ranged from 3 to 5 mm, with 5 mm pockets located primarily on posterior teeth. Areas of plaque and calculus build-up on posterior teeth corresponded to formation of pseudopockets. Gingival inflammation and bleeding upon probing was noted on all teeth. Recession was absent despite minimal to no attached gingiva on the buccal surfaces of most teeth. Obliteration of the vestibule was noted adjacent to molars Nos. 14, 18, 19, 30 and 31 with the buccal vestibule at the level of the free gingival margin. Existing scars around the posterior ventral surface of the tongue not only limited its mobility, but also resulted in the elevation of the floor of the mouth to the lingual free gingival margins. A periodontal diagnosis of generalized plaque-induced gingivitis was made.

Hard Tissue Examination

Plaque and calculus accumulations were heavy, especially on the lingual and buccal surfaces of mandibular posterior teeth. Lower posterior teeth showed extensive decay, specifically on the lingual surface, with food accumulation in the area. There was recurrent decay under existing amalgam restorations on multiple teeth.

Radiographs

Bitewing radiographs showed carious lesions on the distal surface of both lower right premolars. No periapical radiographs could be taken because of inadequate vestibular depth. A digital panoramic radiograph was taken for evaluation of the dentition and temporomandibular joint (**FIGURE 8**). No crestal bone loss was present radiographically.

Treatment Plan

Caries management by risk assessment (CAMBRA)[11] that included an assessment of visible cavitations, plaque, salivary pool and dietary intake was completed. The patient was categorized as "very high risk." The treatment plan included prophylaxis followed by application of 5% sodium fluoride varnish, restoration of Nos. 28 and 29 and extraction of severely decayed Nos. 18, 30 and 31. Implant-supported crowns were taken into consideration as replacements for extracted teeth.

The patient did not express discomfort in relation to the lesion on his back, but supplemental padding was used during dental treatment to prevent potential frictional trauma to the skin. Petroleum jelly was applied on all perioral tissues, commissures and intraoral mucosa to minimize tissue trauma prior to starting dental treatment. A small-diameter plastic suction tip coated with lubricant was used. Prophylaxis was performed using hand scalers followed by the application

of fluoridated varnish. At the subsequent visit, as per the patient's request, composite resin was used to restore the decayed premolars. A rubber dam could not be used due to his limited mouth opening, and lack of sound tooth structure on the molars prevented the use of a clamp. Cotton rolls were split in half, as their placement into the obliterated vestibules was compromised. The mouth mirror was kept lubricated with petroleum jelly to prevent friction and potential blistering of the mucosa. However, upon prolonged contact with dental instruments, the epithelium sloughed off, exposing an area of erythema. Restorative procedures were done under local anesthesia. Due to poor prognosis for the successful restoration of the extensively cavitated lower molars and inadequate access for root canal treatment, it was decided, with the patient's consent, that these teeth be extracted. After consultation with an oral surgeon, it was recommended that extractions under sedation should be attempted in the future.

As per school policy for patients with high risk for dental caries, the CAMBRA kit was dispensed. The kit consists of 16 ounces of alcohol-free 0.12% chlorhexidine gluconate, four ounces of 1.1% sodium fluoride toothpaste, xylitol mints, dental floss and an adult toothbrush. Instructions included using the mouthwash for one minute once a day for one week per month; chewing two pieces of mints four times per day; and brushing with the toothpaste twice a day followed by flossing. In order to maximize oral hygiene maintenance and minimize mucosal trauma, the patient was instructed to use a soft, baby-sized toothbrush. The presence of scarring and hand contractures made flossing difficult. His mother was instructed to help him with flossing, or he could use a flossing aid. The patient was put on a three-month recall schedule for periodic evaluation and periodontal maintenance.

Follow Up

The patient did not follow up as scheduled; hence, a phone interview was conducted. He reported following the oral hygiene instructions without experiencing any discomfort. As the patient did not return for a follow-up visit, we were not able to evaluate the outcome of the intervention. He complained of pain in the lower-left posterior teeth and an appointment with the oral surgeon was scheduled for extraction of the grossly decayed teeth. The procedure will be attempted under IV sedation due to limited mouth opening.

Removable dentures are contraindicated for patients with DEB due to the fragility of their soft tissue and trauma caused by friction.

Discussion

DEB is caused by mutations in the COL7A1 gene encoding the type VII collagen protein.[12] Fibrils that anchor the basement membrane to the underlying dermis are poorly formed and lack maturity, which causes blister formation following minor trauma. The current medical management of this condition includes palliative measures such as using protective padding of the skin and careful wound care to reduce blistering and scarring and to prevent secondary infection.[2] Systemic corticosteroids, retinoic acid, beta carotene and phenytoin are only minimally effective.[13] Patients with extensive skin lesions can benefit from the use of a soft padding such as a wool blanket on the dental chair to avoid traumatizing their skin.[14]

Extensive scarring of the skin can lead to hand or foot deformities called mitten deformities, often seen in RDEB-SG.[4,9,13] Our patient had some deformities on his fingers but was able to use a toothbrush without much difficulty. Flossing aids were required to help with maintenance of his oral hygiene.

Mucosal involvement in recessive DEB can be extensive and frequently manifests with lesions in the oral cavity and esophageal strictures. The frequent and continuous oral ulceration causes mucosal scarring, which eventually leads to microstomia, ankyloglossia and vestibular obliteration.[9,12,15] All these manifestations were present in our patient.

Similar to other reports in the literature, our patient presented with limited tongue and soft tissue mobility. This contributed to decreased food clearance from the oral cavity and high caries incidence, specifically on the buccal surfaces of maxillary molars and the lingual of mandibular molars.[16] Our patient was determined to be at high risk for dental caries, and a combined fluoride and chlorhexidine therapy was advised.

For periodontal therapy, we elected to perform prophylaxis with hand scalers instead of an ultrasonic device. The use of ultrasonic scaling devices is not absolutely contraindicated in DEB patients but caution should be taken when they are used, especially in subgingival areas, to avoid tissue trauma that could result in blister formation and bleeding.[17] In addition, copious irrigation to prevent thermal damage to the teeth and aid in flushing out deposits requires suctioning during the procedure, which in turn increases the potential for tissue trauma. Nontraumatic oral hygiene techniques using customized tools such as baby toothbrushes with warm water-softened shortened bristles may be useful in reaching the cervical portion of teeth in

areas with obliterated vestibules without causing blistering or gingival recession.[17]

Prominent features in this patient included plaque and calculus accumulation and dental caries localized to areas where there was minimal or lack of keratinized tissue and where the vestibule had been obliterated. The lack of resilient keratinized tissue contributed to laxity and the tissue pulled away easily from the tooth. In addition, this created an area where oral hygiene was difficult to maintain. Proper toothbrush positioning can be difficult, especially at the cervical region of the tooth.[18] The attachment of the vestibule to the free gingival margin may result in the gingival margin being pulled in an inferior and lateral direction, thereby opening up the sulcus to more food impaction and compounding the problem of plaque and calculus accumulation.

In patients with DEB, extensive and complete destruction of keratinized tissue is possible over a relatively short period due to the constant cycle of tissue trauma and destruction, blistering and then healing and scarring.[19,20] Buduneli et al. reported the successful use of acellular dermal matrix allograft to gain attached gingiva and facilitate maintenance of dentition.[19]

Restorative modifications include extreme care of fragile tissues with adequate lubrication of instruments with hydrocortisone cream, triamcinolone or petroleum ointment.[14] Small saliva ejectors and malleable retractors can be used to minimize pressure and gently manipulate mucosal tissue.[21] For restorative procedures, the use of a rubber dam will provide adequate isolation but limited mouth opening may prevent proper placement of the clamp.

In this case, extraction of posterior teeth with extensive decay was preferred over root canal treatment and full coverage restoration, so as to decrease operative time and exposure of the mucosa to potential extensive trauma. Additionally, limited visibility and access due to extensive scarring would have further compromised successful endodontic treatment. The wound healing process of extraction sockets in patients with this condition is unaltered.[22] When multiple extractions are planned, treatment under sedation may be indicated.[23]

Once the oral infections had resolved and our patient's dental condition had stabilized, our long-term goal was to provide dental rehabilitation via placement of an implant-supported dental prosthesis. Removable dentures are contraindicated for patients with DEB due to the fragility of their soft tissue and trauma caused by friction. A fixed dental implant prosthesis is supported in the bony structure by means of osseointegration and, unlike removable prostheses, does not rely on soft tissue support. Implant-supported prostheses for replacement of edentulous areas have been reported in the literature, and can be recommended as a more favorable method for oral rehabilitation.[22,24,25] This is possible because the effects of DEB appear to be limited to the soft tissue without any effect on the underlying hard tissue and its healing ability.[25,26] Any bone grafting procedures that are necessary are combined with implant placement when possible to minimize the appointments needed.[27] Nevertheless, management of the fragile mucosa, as well as limited access due to microstomia, are major challenges that need to be considered prior to dental implant placement.

Oral hygiene instructions may need to be customized for the individual patient. Our patient was instructed to perform his daily oral hygiene routine with his mouth closed over the head of the toothbrush so as to relax the adjacent musculature of the cheek and thereby improve access to the buccal side of posterior teeth. Patients should be encouraged to comply with regular follow-up preventive care and application of topical fluoride, so as to minimize caries development and progress, improve oral health and promote early detection of any malignancy.

Recommendations

- Assess the patient's caries risk and physical ability to maintain oral hygiene. We recommended combined fluoride varnish and alcohol-free 0.12% chlorhexidine therapy.
- Establish a treatment plan that focuses on the individual's oral health needs.
- Coat dental instruments and X-ray films/sensor with lubricant. Patients usually tolerate bitewings but may have difficulty with periapical radiographs. Panoramic imaging may be indicated instead of intraoral radiographs.
- Avoid high-vacuum suction and blowing air or water directly onto the mucosal tissue.
- When prosthetic replacement is indicated, a dental implant is more favorable than a removable prosthesis.
- Periodontal maintenance should be scheduled with shorter intervals.
- Emphasize oral hygiene instructions and dietary counseling at every visit.
- A soft baby toothbrush may be helpful to access narrow vestibules. Topical fluoride application and the use of fluoridated toothpaste should be encouraged. ■

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The Art of Matching Anterior Porcelain Restorations: A Clinical Case Report

Emil Hawary, DDS, FAACD, FAGD, DICOI

ABSTRACT Clinicians are constantly challenged with matching one or two incisors to the remaining natural teeth because of the multidimensional properties of color and shape. Single-shade restorations will not adequately match the natural tooth structure and, therefore, will not satisfy most patient expectations. This article describes the steps involved in treatment planning, treatment, laboratory communication and materials for the replication of natural polychromicity to restore and match three incisors to the remaining natural teeth.

AUTHOR

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Advances in dental technology and dental materials have enabled dentists and technicians to restore teeth and enhance smiles in ways once thought to be unattainable. With the ability to restore teeth without metal came the introduction of stronger restorative materials and adhesives.

One of the most difficult challenges facing dentists is matching anterior porcelain to natural anterior teeth. Achieving symmetry of shape, color, value, texture and translucency can be a challenging task. Proper soft tissue control, tooth preparation, good understanding of materials and their application and clear communication with a skilled ceramist are necessary to achieve a predictable esthetic outcome. Porcelain veneers are a conservative treatment modality to enhance a patient's smile, and one that has a high success rate.[1]

When all-ceramic restorations are preferred for an endodontically treated anterior tooth, metal posts may negatively affect the esthetic results.[2] With regard to esthetic concerns, nonmetal posts render esthetic superiority over metal posts. A wide range of esthetic posts is commercially available, such as fiber-reinforced composite resin posts and yttrium-stabilized, zirconia-based ceramic posts.[3-6]

Zirconia is currently a widely used material because of its favorable chemical and physical properties, as well as its esthetic advantage of a color similar to that of natural teeth.[7] Ceramic posts allow better light transmission in the apical and central portions of the crown than cast metal posts; however, they are not as strong.

The purpose of this report is to describe the steps involved in treatment planning, treatment, laboratory communication and

materials for the replication of natural polychromicity to restore and match three incisors to the remaining natural teeth.

Clinical History

The patient was a 44-year-old European male with an unremarkable medical history. He presented with a porcelain-fused-to-metal (PFM) crown on the right central incisor, which had been placed about 20 years prior, following root canal treatment (RCT) and subsequent cast post placement. He had a discolored and worn-down composite restoration on tooth No. 9. He was caries free, had healthy gingival tissues, excellent oral hygiene and had no signs or symptoms of temporomandibular disease. The patient desired a more pleasing smile, but he wished to be treated conservatively and maintain the natural look of his teeth. He emphasized his wish for the treatment not to change his appearance significantly, and his desires were taken into account in the treatment.

Diagnosis

Upon clinical examination, periodontal health, muscles and joints, caries and all other soft and hard tissues were within normal limits. Mild gingival recession (2-3 mm) was diagnosed on some of the teeth and the patient was made aware of it. Gingival grafting was suggested, but the patient opted for no treatment because the recession wasn't causing any esthetic concern. The patient's smile was not esthetically pleasing due to several factors. The right central incisor had asymptomatic root canal treatment and a cast metal post that was contributing to significant darkening of the tooth. The PFM on the tooth had an overly opaque and monochromatic appearance and did not match the adjacent natural teeth. Discoloration was evident and metal was visible at the gingival margin with compromised esthetics. The left central incisor had a discolored and worn-down monochromatic class IV composite restoration. The interdental tissues between the right lateral and right central incisors, as well as between the right central and left central incisors, were missing. This was in addition to the generalized dark shade of the teeth, which were polychromatic and had several maverick colors (**FIGURES 1–4**). In light of these problems, a decision was made to proceed with esthetic restorative treatment to correct them. Radiographically, there were no significant findings and the patient presented with adequate bone levels.

FIGURE 1. Preoperative full-face view.

FIGURE 2. Preoperative retracted frontal view showing an opaque monochromatic PFM on No. 8 and discolored large composite on No. 9.

FIGURE 3. Preoperative retracted right lateral view.

FIGURE 4. Preoperative retracted left lateral view.

Treatment Plan

Different treatment options were presented to the patient. Because of the large-sized post and inadequate remaining tooth structure on tooth No. 8, the patient was informed of the guarded prognosis and possible future root fracture. He was thus offered the option of extracting tooth No. 8 followed by immediate surgical placement of a root-form implant supporting a zirconia crown on a zirconia custom abutment. The patient opted to keep tooth No. 8 and to replace the previous PFM. The patient was offered a smile makeover through veneering more anterior teeth, but he wanted to keep his natural look. Accordingly, the elected treatment plan included replacing the PFM on the right central incisor, veneering the left central incisor, class III composite restoration on the mesial of the right lateral incisor and bleaching. The patient was accepting of the current look of his teeth and wanted the new restorations to mimic the natural characterization of his teeth, which guided the treatment elected.

In order to address the patient's chief esthetic concerns, the plan included the following elements:

Development of a composite mock-up on the study casts to evaluate proper tooth morphology and tooth length for better esthetics and proper gingival contours. This was presented to the patient to assist in determining the course of treatment.

FIGURE 5. The old PFM crown was removed revealing the discolored root and dark tissue margin. Preparation of No. 9 extended 0.5 mm subgingivally on the facial and the gingival proximal area extended lingually at the crest of the papilla.

FIGURE 6. Stump shades were chosen with the stump guide in view for laboratory use.

FIGURE 7. Full-smile view showing the temporaries to guide the laboratory for the length and form of the final restorations.

The composite mock-up was used to fabricate the following:

- Sil-Tech putty (Ivoclar Vivadent AG, Amherst, N.Y.) anterior incisal template.
- A reduction pinhole preparation guide to help in proper tooth reduction.
- Polyvinyl siloxane putty (Splash!, Discus Dental LLC, Culver City, Calif.) for fabricating accurate provisional from the mock-up.
- Replacement of the cast metal post and PFM on the right central incisor with a zirconia post with pressed ceramic core and porcelain jacket crown (Noritake Dental Supply Co. Ltd., Nagoya, Japan).
- Porcelain veneer (Noritake Dental Supply Co. Ltd.) on the left central incisor to mirror image the right central incisor.
- Class III composite resin bonding on the mesial of the right lateral incisor.
- Fabrication of an occlusal guard.
- In-office bleaching using Zoom 2 whitening system (Discus Dental LLC).

Treatment

Prior to the teeth preparation appointment, a diagnostic wax-up of the right central incisor and the left central incisor was created to analyze the case. On the study model, the right central and left central incisors were built to the planned contour using a chairside, light-cured composite.[8] Two sets of a silicone putty index were fabricated, one to be used as a stent for chairside provisional fabrication and the other as a preparation guide.[9]

Preparation

The patient was anesthetized via local infiltration with Septocaine with 1:100,000 epinephrine (Septodont, New Castle, Del.). The old PFM crown and cast metal post were removed with diamond and carbide burs, followed by the Christensen crown remover (Hu-Friedy, Chicago) and automatic crown and bridge remover (J. Morita USA Inc., Irvine, Calif.). The degree of tooth discoloration determined how much tooth structure to remove at preparation time. It is preferable to treat discoloration chairside, so that the final result will be more predictable. This prevents the less predictable step of masking underlying tooth structure with porcelain. Because of the dark color of the endodontically treated right central incisor, bleaching was done to lighten the existing preparation color. The old post and core were removed and the tooth was internally bleached. Care was taken to seal the coronal aspect of the root canal. Shoulder preparation margins on the right central incisor were refined using a KS1 diamond bur (Brasseler USA, Savannah, Ga.) to full depth 1.2 mm circumferentially and then with a fine-grit end-cutting bur (Brasseler USA). Internal line angles were rounded using a KS3 fine-grit diamond bur (Brasseler USA). Marginal placement was at 2.5-3 mm from the osseous crest as determined through osseous sounding. Osseous sounding provided a stable reference to minimize the chance of biological width invasion and direct location of interproximal contact, thus increasing the predictability of subgingival margin stability. The margins were 0.5-0.75 mm subgingival. Placement of interproximal contacts at 4.5 mm from the osseous crest also minimized the possibility of "black triangles." Slight discoloration was still present at the gingival margin, leaving the stump too dark.[10] Our goal was a brighter stump shade, such as A1. The facial aspect of the tooth was slightly prepared 1 mm above the prepared margins and a thin layer of pink opaquer was applied on the tooth to block out the discolored tooth structure.[11-14]

The post space was prepared using Peeso reamers (Premier Dental Products, Plymouth Meeting, Pa.). Preparation of the left central incisor was guided by reduction templates (pinhole preparation guide, Shofu Dental, San Marcus, Calif.). The preparation was extended 0.5 mm subgingivally with a 1 mm chamfer margin on the facial, and the lingual margins were placed at the incisal marginal ridge for maximum strength of the tooth and the restoration. Lingual margins should not be placed in the lingual fossa, which is the area with the highest concentration of stress on the entire tooth.[15,16] The tooth was prepared in such a manner as to give the laboratory 2 mm of incisal and 1.5 mm of facial room to develop subtle internal characterization with the porcelain. The gingival proximal area extended lingually at the crest of the papilla to provide adequate porcelain to eliminate black triangles (**FIGURE 5**).

FIGURE 8. Try-in of the zirconia crown on tooth No. 8 showed that it was higher in value. Custom staining was done to match the rest of the teeth.

FIGURE 9. The porcelain veneer was bonded to No. 9. Temporary restoration was removed from No. 8 to try in the zirconia post with pressed ceramic core. Note insufficient remaining tooth structure indicating guarded prognosis; however, adequate ferrule was present all around.

FIGURE 10. Postoperative radiograph showing zirconia post and porcelain jacket crown on the right central incisor.

Polishing of the preparations was completed with rubber cups and ceramiste points (Shofu Dental). A small amount of gingival contouring was also done with electrosurge (Parkell Inc., Farmingdale, N.Y.) prior to taking the final impression. Stump shades were chosen and photographs were taken of the preparations with the stump guide in view for laboratory use (**FIGURE 6**).

The right lateral incisor was bonded mesially and palatally with renamel composite (Cosmedent, Chicago) after removing the decay and the previous leaking palatal amalgam. Shade A1 with some maverick colors including dilute white and ochre were added to mimic the patient's natural dentition.

The final impression was taken (Impregum, 3M ESPE, St. Paul, Minn.), blowing the impression material into the sulcus. Using the polyvinyl siloxane impression off the mock-up study casts and with the use of Luxatemp shade A1 (Zenith/DMG, Englewood, N.J.), the provisional restorations were made, trimmed, polished and cemented on the patient's teeth with clear TempBond (Kerr, Orange, Calif.).They were shaped to achieve proper contours and margins to evoke good gingival and papillary response. Anterior, lateral and protrusive movements were checked for contact and function. The incisal end-to-end position was also evaluated for proper function.

The patient came the next day for his postoperative appointment. He was pleased with his new smile and needed only minor adjustments. The author critiqued the provisional restorations and noted that the incisal edges needed to be lengthened. An alginate impression of his upper provisionals was made, poured up in stone and sent to the laboratory. Photographs were taken of the provisional as well to facilitate laboratory communication.

FIGURE 11. Preoperative full smile.

FIGURE 12. Postoperative full smile.

The patient's teeth were bleached with Zoom 2 whitening system (Discus Dental LLC) and he was scheduled to come in for shade selection, where a color map drawing and photographs, along with the shade guide, were taken.

Laboratory Instructions

A detailed prescription was sent to the laboratory, including upper and lower full-arch polyvinyl siloxane impressions, centric bite registration record, upper cast with the provisional in place, stump and tooth shade selection, color mapping and characterization instructions and all required digital images on a compact disc.

The ceramist was asked to increase the length of the final restorations using the cast of the provisional as a guide to improve the smile line and provide a more pleasing smile (**FIGURE 7**).

Try-in

After the restorations were completed, they were tried in (**FIGURE 8**) and were evaluated for marginal fit, contours and color. Some shade-matching challenges were anticipated because of the pure opaque white nature of the zirconia post and the pressed ceramic core. When dissimilar restorative materials are used, it is important to establish similar values before any addition of chroma is made. Excellent communication with the laboratory, with a mutual understanding of both clinical and technical challenges, will facilitate excellent treatment outcome.

The veneer for the left central incisor was placed and tried in with RelyX try-in paste shade Tr (3M ESPE). Then 1:1 digital photographs were taken and both the ceramist and the author mapped out on the

FIGURE 13. Postoperative retracted frontal view.

FIGURE 14. Postoperative retracted right lateral view.

FIGURE 15. Postoperative retracted left lateral view.

FIGURE 16. Preoperative close-up view.

FIGURE 17. Postoperative close-up view.

FIGURE 18. The patient's new radiant and confident smile.

images the enhancements required. Custom staining was done and meticulous attention was given to shade, value, outline form, contours, surface anatomy and texture.

Cementation

After anesthesia was administered, the temporary restorations were removed and the porcelain veneer of the left central incisor was tried in. After obtaining consent from the patient, the decision was made to bond the veneer. The preparation was air-abraded with 50 micron aluminum oxide powder using the MicroEtcher (Danville, San Ramon, Calif.) to remove any remaining cement and to obtain a fresh, roughened surface for bonding.[17]

The tooth was then etched with 37% phosphoric acid for 15 seconds, rinsed with water and moistened with a cotton pellet dampened with Gluma desensitizer (Heraeus Kulzer, South Bend, Ind.).[18] Next, the preparation was coated with a dentin primer and adhesive (Optibond Solo Plus, Kerr) for more than 20 seconds, air thinned and light cured. The porcelain veneer was silanated (Ultradent, South Jordan, Utah) and when ready, a coat of prime and bond NT was applied to the inner surface. RelyX luting cement Tr shade (3M ESPE) was used to bond the tooth. The restoration was then cured with 501 optilux light (Kerr) for 3 seconds. Excess cement was removed and DeOx glycerin gel (Ultradent) was applied to the margin to avoid an oxygen-inhibited layer. Then the tooth was light cured for an additional 40 seconds on the facial and the lingual. Excess cement was carefully removed using a Bard Parker scalpel No.12 (Aspen Medical, Caledonia, Mich.). The margins were polished with Enamelize diamond polishing paste (Cosmedent) and prophy cup (**FIGURE 9**). The occlusion was evaluated to ensure light centric contact and even contact on excursions.

The zirconia post with pressed ceramic core for the right central incisor was tried in and then bonded using RelyX Unicem resin cement (3M ESPE). Ultrapack 000 and Ultrapack 1 (Ultradent Products Inc.) retraction cords were placed after being impregnated in hemodent (Premier Dental Products). An impression was made (Imperium, 3M ESPE, St. Paul, Minn.), blowing the impression material into the sulcus of the right central incisor. A new photograph of the stump shade of the right central incisor was taken. The temporary was then recemented using clear TempBond.

A few days later, the porcelain jacket crown of the right central incisor was tried in. Photographs were taken to modify it to mirror image the left central incisor and match the adjacent teeth. The same steps were followed with the try-in of the veneer on the left central incisor. The temporary crown was then recemented using TempBond and the porcelain jacket crown was sent back with photographs to the laboratory to refine the shade. When the patient returned for insertion, the crown was tried in to confirm the fit. It matched the veneer on the left central incisor and adjacent teeth. The patient was pleased with the outcome and approved the final restoration for placement.

It was cemented using RelyX Unicem resin cement. Excess cement was removed and the margins were polished with Enamelize and prophy cup (**FIGURE 10**).

The occlusion was adjusted in the centric occlusion and the eccentric excursions. Even contacts on the central incisors in protrusive movement were established. Adjusted surfaces were polished using the Dialite polishing system (Brasseler USA). An occlusal guard was fabricated and delivered to the patient.

Summary and Conclusion

The esthetic enhancement of this patient's smile was accomplished with a zirconia post, pressed ceramic core and porcelain jacket crown on the right central incisor and a porcelain veneer on the left central incisor mimicking the right central incisor. The restorations blended well with the existing dentition, resulting in improved esthetics. With the attention to detail and extra efforts taken by the clinician to diagnose, treatment plan and execute the necessary steps, a satisfying functional and cosmetic result was achieved (**FIGURES 11–17**). This also necessitated a collaborative relationship between the dental laboratory technician and the clinician. The patient was pleased with the esthetic outcome (**FIGURE 18**).

Esthetic treatment can be challenging, especially when combining different types of restorations for maxillary incisors, but proper treatment planning, execution and team collaboration can ensure treatment success and patient satisfaction. ■

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Alternative Approach to Management of Early Loss of Second Primary Molar: A Clinical Case Report

Ravi Agarwal, BDS; Kalpna Chaudhry, MDS; Ramakrishna Yeluri, MDS; Chanchal Singh, MDS; and Autar K. Munshi, MDS

ABSTRACT Preservation of space after premature loss of the second primary molar is essential to prevent mesial drifting of the permanent first molar. Various modifications of distal shoe space maintainers, which have been documented, are all nonfunctional in nature. This paper describes an innovative design of a functional distal shoe space maintainer that is intended to overcome the disadvantages of conventional non-functional space maintainers and that does not hamper the periodontal status of the abutment tooth.

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Premature loss of primary teeth results in space loss, as reported in the early 20th century by Stallard, Lyons, Willet and others.[1] This may be due to deep dental caries, trauma or congenital absence of teeth, which may present significant problems for a growing child.[2] About 51 percent of prematurely lost first primary and 70 percent of prematurely lost second primary molars result in a loss of space and consequent malposition of the permanent tooth in that quadrant.[3] Premature loss of the primary second molar prior to the eruption of the permanent first molar can lead to mesial movement and migration of the permanent molar before, during and after its eruption. When the deciduous second molar is lost before the eruption of the first permanent molar, an intraalveolar type of space maintainer is indicated.

A functional space maintainer is always preferred over a nonfunctional one in the posterior region for its various advantages.[4] Moreover, before the eruption of the permanent molar, space preservation of the second premolar or the guidance of eruption of the first permanent molar is essential. The intent of this paper is to present an innovative case of a functional distal shoe space maintainer to guide the eruption of the maxillary first permanent molar followed by a functional band and bar space maintainer until the eruption of the underlying second premolar.

Case Report

A healthy boy aged 5 years and 4 months reported to the Department of Pedodontics and Preventive Dentistry complaining of pain in the upper-right, back region of the jaw that had been occurring for six months. The pain was

FIGURE 1. Preoperative photograph showing grossly decayed right second primary molar.

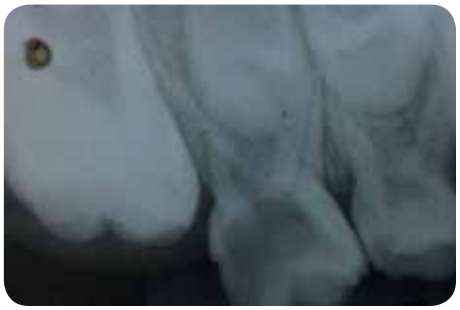

FIGURE 2. Preoperative intraoral periapical radiograph showing furcation involvement and root resorption.

FIGURE 3. Try-in radiograph to confirm the distal intraoral extension.

FIGURE 4. Fabrication of the appliance.

FIGURE 5. Cementation of appliance.

FIGURE 6. Removal of the appliance after the eruption of first permanent molar.

severe, spontaneous and throbbing and was sometimes aggravated at night. On clinical examination, the upper-right deciduous second molar was grossly decayed and tender on percussion, and grade II mobility was observed (**FIGURE 1**). Radiographically, furcation involvement, internal root resorption and widening of the periodontal ligament space were evident (**FIGURE 2**). A clinical diagnosis of chronic, irreversible pulpitis was made. Because of the grossly destructed crown structure, extraction was deemed necessary, followed by preservation of the space until the eruption of the first permanent molar. In order to overcome the disadvantage of placing a nonfunctional distal shoe space maintainer, a modified version of the same functional distal shoe space maintainer was designed and fabricated. The procedure was explained to the parent and informed consent was obtained.

Appliance Design and Fabrication

A stainless steel band was adapted to the right maxillary first deciduous molar and an impression was made in alginate. The band was removed from the tooth, transferred to the impression and stabilized, and a cast was poured in dental stone. The distal surface of the second primary molar was marked on the cast and the tooth was scraped off from the cast. A V-shaped notch was made at the marked point. The depth of the notch was determined from an intraoral periapical radiograph and extended 1 mm below the mesial marginal ridge of the erupting first permanent molar. A loop with a V-shaped extension distally was fabricated on the first primary molar up to the slot made on the cast. The distance between the buccal and lingual loops was maintained in such a way that it accommodated an acrylic tooth of the dimension corresponding to the second primary molar. The distal surface of the loop was bent at a right angle into the prepared slot. The loop was then soldered to the band. Additional 0.9 mm orthodontic stainless steel wire was soldered mesiodistally and buccolingually, resting passively on the gingiva to give support to the acrylic tooth and distribute the occlusal forces. The appliance was finished, polished and disinfected before it was tried in the patient's mouth.

During the next visit, the decayed right maxillary second primary molar was extracted under local anesthesia. After achieving hemostasis, the appliance was tried in the patient's oral cavity and the position of distal intraalveolar extension was confirmed by radiography (**FIGURE 3**). The patient's centric occlusion was recorded, and the upper and lower casts were mounted on a mean value articulator in a centric relation. The appliance was transferred onto the cast and a resin tooth

FIGURE 7. Trimming of the distal intraalveolar extension.

FIGURE 8. Recementation of the appliance after trimming the intraalveolar extension.

FIGURE 9. Intraoral periapical radiograph after nine months, revealing healthy periodontal ligament of the abutment tooth.

FIGURE 10. Appliance was modified into a functional band and bar space maintainer after eruption of the first permanent molar.

FIGURE 11. Gingival status of the pontic region during recall visit at one-month follow-up.

corresponding to the primary maxillary right second molar was trimmed and adjusted onto the cast using autopolymerising acrylic resin (**FIGURE 4**). Occlusal adjustment was made on the articulator, and finishing and polishing of the space maintainer was done using 1000-grit silicon carbide paper (3M ESPE, St. Paul, Minn.) and pumice. The appliance with a single acrylic tooth resting passively on the alveolar ridge was inserted and the occlusion was adjusted. The appliance was then cemented using glass ionomer luting cement (Ketac-Cem, 3M ESPE, Seefeld, Germany) (**FIGURE 5**).

The patient was followed up regularly until the first permanent molar erupted (**FIGURE 6**). Nine months after the eruption of the first permanent molar, the appliance was removed. The intraalveolar extension was trimmed away (**FIGURE 7**), smoothed and recemented to serve as a fixed functional space maintainer until the complete eruption of all permanent first molars (**FIGURE 8**). After the first permanent molar erupted completely, a radiograph was taken to observe the status of the periodontal ligament in relation to the upper-right primary first molar. (**FIGURE 9**). Additional support was obtained by banding the first permanent molar and converting the appliance into a functional band and bar appliance until the eruption of the second premolar (**FIGURE 10**).

The patient is under monthly follow-up to evaluate his oral hygiene and the position of the underlying premolar (**FIGURE 11**).

Discussion

Extensive dental caries is the most common cause for the premature loss of a deciduous tooth.[5] Depending on the tooth lost and segment involved, different types of space maintainers are indicated for restoring the normal function and eruption of the permanent teeth. If the space maintainer is not placed in a timely fashion, it could result in severe posterior crowding and expensive orthodontic treatment. A distal shoe space maintainer is indicated in the case of the premature loss of a deciduous second molar before the eruption of the permanent first molar. The use of this appliance in the mandibular arch is well documented, but its use in the maxillary arch is still debatable. The normal path of eruption of the mandibular first permanent molar is in the mesial and lingual direction, erupting against the distal surface of the second primary molar and using it as a buttress to guide itself into position. In contrast, the maxillary first permanent molar erupts in a distal and a facial direction until it meets muscular resistance. It then erupts in a mesial direction until it makes contact with the distal surface of the second primary molar.

The success criterion of a distal shoe space maintainer is the successful guidance of the unerupted permanent tooth in the

arch with no complications associated with the appliance.[6,7] Even though the path of eruption of the maxillary molar does not favor the use of the appliance in the maxillary arch, Breakspear[8] proved that the maxillary second deciduous molar has a substantially greater average rate of closure than any other premature extraction spaces. Davey[9] also noted that greater average space loss occurred in the maxilla when second deciduous molars were extracted before the eruption of the first permanent molar. Thus, it is necessary to place a space maintainer in case of premature loss of the maxillary second deciduous molar before eruption of the first permanent molar. Once the first permanent molar erupts, the distal shoe is changed into a reverse band and loop space maintainer, which is later converted into a conventional band and loop once the first permanent molar completely erupts. The main disadvantages of a nonfunctional space maintainer in the posterior region are that it does not help with mastication and there are chances of a supraeruption of the opposing tooth. To overcome the disadvantages of a nonfunctional space maintainer in this case, a functional distal shoe space maintainer was fabricated. There are various advantages of a functional space maintainer. It prevents supraeruption of the opposing tooth, helps in mastication, preserves the mesiodistal dimension and does not restrict normal growth and development.[4,10]

In this case, the support for the second primary molar was obtained from a single tooth, the first primary molar, because there was no other anchor tooth available in the arch. It has been stated that clinically the occlusal forces in children are not uniaxial.[11] Thus, forces are not concentrated at one particular point. This prevents excessive load on the abutment tooth and dislodgement of the appliance, as cantilever designs in the posterior region are not ideal. Also, additional 0.9 mm orthodontic stainless steel wire was soldered mesiodistally and buccolingually, resting passively on the ridge so as to give extra support to the acrylic tooth for dissipating masticatory forces. In this case, the patient was recalled every month and the appliance was removed at each visit. Oral prophylaxis and fluoride applications were carried out and the appliance was recemented to ensure that the patient's oral hygiene was not hampered. Once the permanent molar erupted completely, additional support was obtained by banding the first permanent molar and converting the appliance into a functional band and bar appliance until the eruption of the second premolar. After nine months, when the first permanent molar erupted completely, a radiographic examination revealed no damage to the periodontal ligament of the abutment tooth and no mobility and early exfoliation of the abutment tooth. The patient will continue to have regular follow-up until the eruption of the underlying premolar. There are some shortcomings to this appliance, such as the need for extensive patient compliance, elaborate laboratory procedures and frequent follow-up visits. But considering the benefits of the appliance, these few shortcomings may be overlooked.

Conclusion

Keeping in mind the comfort of the child, an innovative approach was tried in this case of the premature loss of a second deciduous molar. The child accepted the appliance well and he experienced no discomfort throughout the treatment. ■

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Factors Driving Recent Changes in Dentists' Incomes

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Money is sometimes a difficult topic for professionals to discuss. Although it comes denominated in numerical units, it has a personal value dimension that permits individual and often emotional reactions. We have our individual standards about what money means, and these may even shade what evidence we consider and how it is interpreted.[1] Effective policy for the dental profession depends on accurately gauging the available data. This is especially true in economically unsettled times.

Dentists' Earning Power Across Their Careers

Dentists are among the top earners in the United States. However, the income stream is not uniform across dentists' careers. Virtually all dentists start their adult lives at an economic disadvantage, compared with their peers, because they must invest heavily in their careers. The educational debt of predental students averaged $36,000 in 2010.[2] This is about 30 percent higher than college loan debt in the general population.[3] Four years of dental school now involve an average debt accumulation of $209,000.[2] Paying back the principal and interest over the first years of practice produces a debt service burden of about $40,000 per year. It is becoming increasingly difficult for new graduates to "start slow" in a scratch practice or in underserved areas. As a result, young practitioners are more likely to incur additional debt for practice purchase shortly after graduation, often in the $400,000 to $500,000 range. The combination of undergraduate, dental school, practice purchase and start-up costs generally places today's 30-year-old dental graduates $600,000 to $700,000 behind their peers. To this must be added the lost income potential from being in school while former college classmates have been receiving a paycheck.

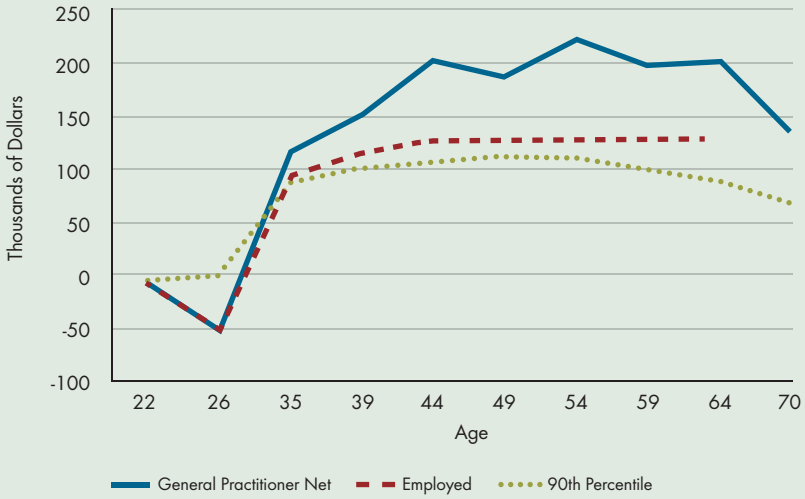
This pattern of debt and income is depicted in **FIGURE 1**, which graphs debt and income across a dental career. A typical 21-year-old entering dental school spends approximately $9,000 per year for the four years preceding dental school. In dental school, the customary rate of further debt accumulation is roughly $50,000 per year.

The first 10 years of practice involve a massive reversal in debt and income

streams. By the time dentists are established, at the beginning of their general practice careers, they are earning at a positive rate of about $100,000 net each year. That figure is the combination of income earned from practice[4] minus paying back both educational and practice establishment debt. Those dentists whose parents supported them in school and welcomed them into the family practice are more than $50,000 per year ahead of their professional colleagues — a head start they enjoy for only about a decade, but which may amount to half a million dollars over their career. In an increasing trend, more than half of current dental students have parents with professional or graduate degrees.[2]

Two lines in **FIGURE 1** diverge from the low point of educational debt/income accumulation rate at about age 26. The dashed line in the center of the graph depicts dentists who work as employees and do not acquire a practice. They save the costs of practice purchase, but they also earn less as practitioners, according to ADA figures.[4] Owner general dentists average about 125 percent of the incomes of employee dentists. That diminished earning potential continues for as long as they are employees. Not shown is the curve for dentists who become specialists. The pattern of specialists' rate of debt and income accumulation would be similar to the general practitioners', except that the start of the upward bend is delayed several years because of training and then rises quickly and plateaus at about 1.6 times the level of the general practitioner.[4]

FIGURE 1 illustrates that dental education is an outstanding investment. Adding to the investment through specialty training or by purchasing a high-volume practice produces returns that are even more attractive. The only individuals for whom this dream is shattered are the approximately 4 percent who start dental school and wash out or who never succeed in obtaining a license to practice.[5] This is an economic catastrophe, as federally sponsored educational loans cannot be forgiven, even in bankruptcy.



Sources: ADA Survey of Dental Practice, American Association of Dental Schools Survey of Seniors and U.S. Census data.

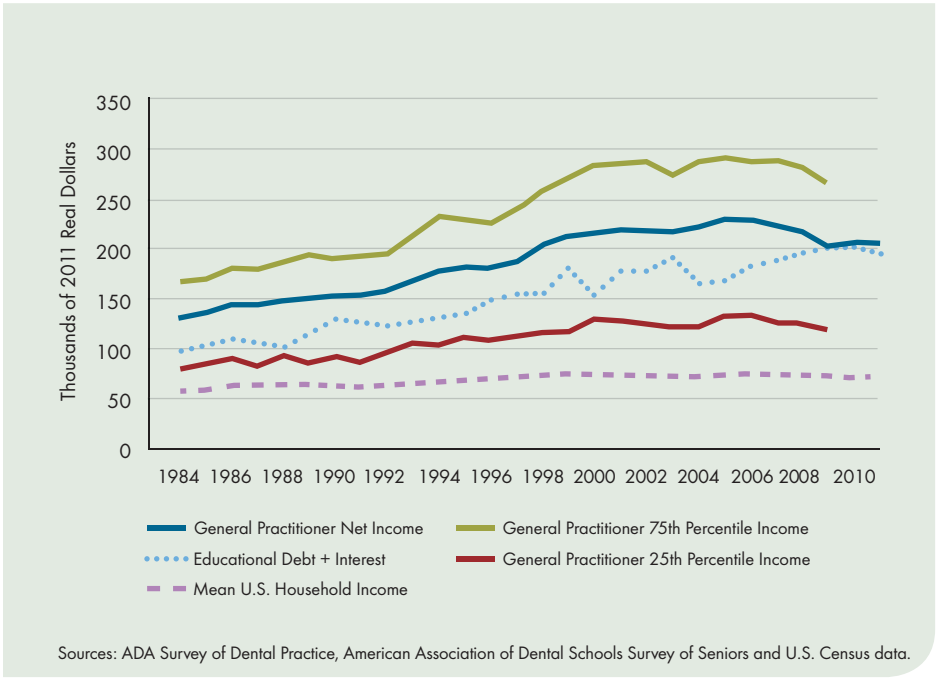
FIGURE 1. Earnings rates for general dentists and top earners in the American economy over their career paths.

The peak earning years for dentists are between the ages of 45 and 65. To place this in context, the dotted line in **FIGURE 1** shows the earning path of all Americans in the 90th percentile.[6] In any representative gathering of people in this country, only about 3 percent will have greater net income per year than the dentists represented in the graph. The dotted-line curve for U.S. incomes at the 19th percentile shows the same age-related bowed curve that characterizes dentists. It has been assumed at the beginning of the curve that educational debt for others is only half what it is for dentists and that there are negligible loan costs associated with beginning a career in other fields. Compared with other high-earning Americans, dentists reach their maximum earning potential later than their counterparts, partially because of having to pay for a practice that those who work for a salary do not have to purchase.

The lifetime income of various groups in **FIGURE 1** is represented by the total area under each curve. The part of dentists' career path where the changes are the largest and come the quickest are the most sensitive to proper decision making and habit formation. There is a large swing in financial status for dentists between the ages of 26 and 40. Just a few degrees' change in the direction of one's career here will have life-altering effects. The first 12 years matter more than all the rest in the formative sense.[7]

Dentists' Earnings Over the Past Quarter Century

The net incomes for Americans have risen by a very small amount over the past quarter century (actually declining in the past few years).[3,6] This trend is depicted in **FIGURE 2** as the bottom, dashed line. This represents the mean U.S. household income in



Sources: ADA Survey of Dental Practice, American Association of Dental Schools Survey of Seniors and U.S. Census data.

FIGURE 2. Net income of general dentists (with interquartile ranges), total educational debt and interest and mean United States household income.

real 2011 dollars. ("Real dollars" are used by economists to control for the masking effects of fluctuating inflation. All values in **FIGURE 2** are expressed as 2011 dollars adjusted by the Consumer Price Index [CPI].) A regression line on the mean U.S. household income between 1984 and 2011 shows an average annual increase of $584. Over the entire period, this is a 23 percent growth in real spending power. Recently, in the period 2006 to 2011, real mean American income declined at an annual rate of $768 per year, or 3 percent. This decline in household financial resources has very likely affected dentists' incomes by reducing the affordability of dental care.

General dentists have done somewhat better than Americans generally.[4] The solid blue line in the center of **FIGURE 2** shows net income for independent general dentists over the same period. Dentists' incomes started higher than the average public income in 1984 and rose faster over the next 26 years. The overall increase in real dollars was 56 percent. Today, the average American dentist in general practice has 2.9 times the buying power of the average American family.

Beginning in 2006, two years before the recession, the net incomes of independent general dentists and specialists began to fall. Between 2005 and 2010, general dentists' net incomes fell by 11 percent. The most recent years have been stable.

Some dentists earn more than others do. This is shown in **FIGURE 2** by the two thin lines that form a sleeve around the trend lines for dentists' incomes. The uppermost line is the 75th percentile for general dentists' incomes. One in four general dentists earned more each year than the value denoted by the top line. The mirror-image line below the average income line represents the bottom quartile of general dentists. One in four in private general practice earned less than this amount. It is evident that there is a wide variation in earning power among dentists. It is also apparent that this discrepancy is growing. Over the entire period studied here, the average dentist earned 3,579 real dollars more each year (based on regression analysis). Dentists in the bottom 25th percentile added an average of $2,129 or less per year. Those in the top quartile did much better, with a $5,613 or better annual increase. The top is rising faster than the average.

Dental educational debt has also risen faster than inflation.[2] In 1984, the typical dental student borrowed (loans plus interest) the equivalent of 75 percent of the average annual net income of a general practice dentist. Recently, four years of dental education cost almost as much as a general dentist earns in a single year. This is shown in **FIGURE 2** by the dotted line. (The figures used are the American Dental Education Association's total college and dental school indebtedness reported on the Survey of Seniors, plus the average interest rate for Stafford and Heal loans, with an eight-year payback period.[2]) There have been three factors pushing dental student educational debt:

Post-secondary education tuition increases generally have about doubled the pace of inflation for the past several decades.[8]

Between 1984 and 2008, support for state dental schools declined by 31 percent.[9]

Between 2001 and 2012, nine new dental schools opened, with four more scheduled to come online in the next two years. All but two of these are private institutions that charge about 40 percent higher tuitions than do state schools.[9]

Among college loans, dental school loans, practice purchase and start-up costs, by far the greatest debt load comes from practice start-up rather than education. The Institute of Business Appraisers shared its data on dental practice purchase costs for the period covered in this analysis. Only the information

from 1993 through 2005 had sufficient numbers of data points on which reliable estimates could be based. For the first six years of this period (the mid- and late-1990s), the average practice sale was $385,000. It then began a rapid climb and averaged $475,000 in the first part of the 21st century. Interviews with practice brokers suggest that the current market continues these historical trends. Thus, a reasonable estimate is that it costs 2.25 times the total educational debt plus interest to establish a dental practice.

Exploring the Drivers

Economists are interested in what makes lines slope this way or that and what causes curves to bend. Those with their hands on the policy levers would like to know what will happen when various actions are taken. The forces that have affected the financial health of dental practices include availability of insurance, use of auxiliaries, general conditions in the economy, dental fees and the ratio of patients to dentists.

Insurance

Most dental care is now paid for by insurance.[10] Almost 49 percent of the American dental bill is picked up by private insurance and another 10 percent is covered by other payers, primarily the government in the form of Medicare and Medicaid payments, plus direct care through the Indian Health Service, the uniformed services, etc. From a slow and strongly resisted beginning in the 1960s, insurance has become essential to dentistry. Between 1984 and 2011, it pumped more than a trillion dollars into oral health.[10] The term "insurance" is a misnomer. Normally, this means spreading the risk of extraordinary and unpreventable costs across the user pool. By contrast, dental "insurance" is a mechanism for industry and the government to provide prepaid oral health care services, thus subsidizing the market.

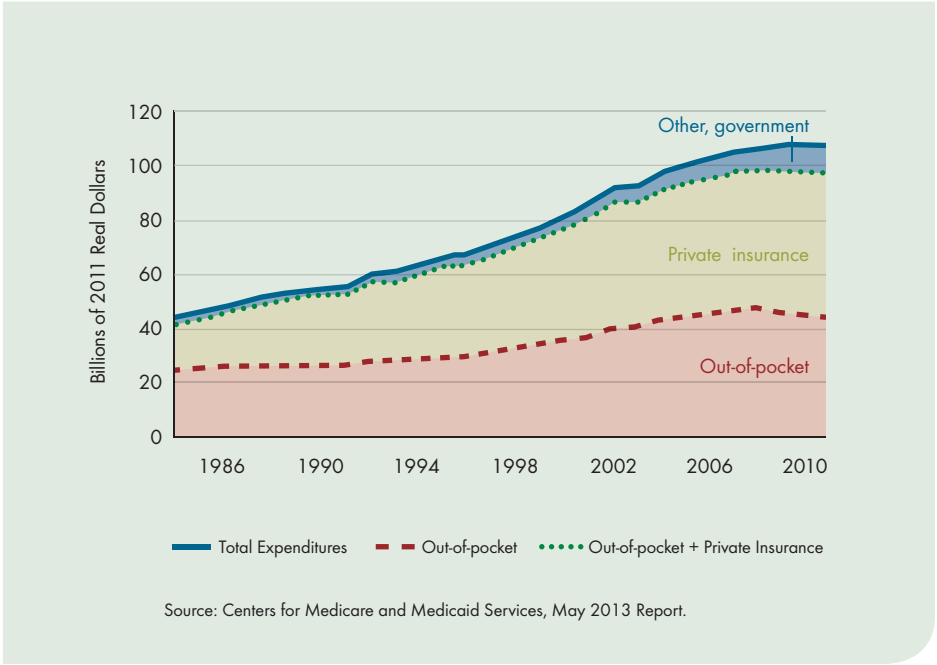


FIGURE 3. Total oral health expenditures by source: out-of-pocket, private insurance and other, primarily government (units are billions of 2011 real dollars).

FIGURE 3 shows that total spending on oral health rose steadily at a rate of $2.7 billion per year until about 2005, when it flattened. This is a stacked graph, so the top solid line represents total oral health expenditures. The spaces between the base and the dashed line half-way up are out-of-pocket contributions paid by the families of those receiving care. The space between the dashed and the dotted lines depicts private insurance support, and the government contribution is shown in the thin wedge below the top line and the dotted line. All numbers are in 2011 CPI adjusted real dollars. Regression analysis shows that private insurance increased at a faster rate ($1.4 billion per year) during this period than did out-of-pocket contributions ($950 million per year).

A soft spot was hit around 2008. During the recession years between 2008 and 2011, total expenditures for oral health care were nearly flat at plus 1.3 percent. The reduction in personal spending of 6.7 percent was offset by a 2.6 percent increase in private insurance and a huge boost from a greater than 36 percent infusion of government and other money.

Overall size of the insurance fund is too lumpy a measure to help understand the recent change in dentists' incomes. The proportion of Americans covered by dental insurance has declined from about 50 percent in 1984 to 37 percent in 2011.[11] The average dental payout, however, has remained relatively constant. Fewer people seem to be seeking care. At the same time, dentists are focusing more on insured patients. "Insurance-free" offices are, according to the ADA Survey of Dental Practice,[4] extremely rare, accounting for less than half of 1 percent of general practices.[4] The same source reported that the proportion of patients treated who have no insurance coverage declined by 3 percent, from 32 percent in 1990 to 29 percent in 2009. At the same time, general practices saw fewer patients on public assistance insurance. Between 1990 and 2009, the proportion fell from 44 percent of qualifying individuals to 39 percent.

Use of Auxiliaries

Data from the ADA Survey of Dental Practice show that general dentists' net incomes do not parallel the average hours dentists work. Through the 1950s and 1960s, dentists worked about 47 hours per week. Today, they are in their offices approximately 36 hours per week.[4] As dentists' incomes rose by 50 percent between 1990 and 2005, hours worked declined by 8 percent, from 1,808 to 1,680 per year. There is no difference in the number of hours worked across the age range from 30 to 65, but women report working an average of 5 percent fewer hours than their male counterparts.

It is likely, however, that use of auxiliaries is one of the drivers of increased practice income. Fifty years ago, it was not uncommon to encounter offices with only a single employee in addition to the dentist, or even none. In 2009, the average number of employees was 4.4, a 29 percent increase from 1990.[4] The use of hygienists follows a similar pattern. Considering the proportion of offices with hygienists and the average number of hours hygienists work per week, there was a 54 percent increase in hygiene hours between 1990 and 2005, according to reports in the ADA Survey of Dental Practice. In 1990 there were 3,953 graduates of hygiene programs; in 2011 the number had increased to 8,007.[12] According to the ADA, 70 percent of the variation in the net income of general dentists is a function of the number of auxiliaries employed.[13] It is estimated that the use of hygienists boosted the net earnings of dentists by $58,290 per practice in 2003.[14]

It is possible that the effective extension of the number of auxiliaries per office has been reached. A significant force that drove steady increases in dentists' incomes over the past 25 years has plateaued based on the current model.

Demographic and Economic Factors

An article by the Health Policy Resources Center of the ADA appearing in the May 2012 issue of *The Journal of the America Dental Association* presents a careful analysis of the recent trends in practice income.[15] A strong case is made that the recent dip in incomes is only partially a result of the general recession that hit at the end of 2008 and from which we are slowly recovering. The decline started about three years prior, and it is almost certainly a reflection of forces such as patients not going to the dentist as often and a change in the ratio of patients to dentists. Further, gross billings between 2005 and 2009 increased by 0.92 percent, but gross collections decreased during the same period by 0.27 percent. Patients now pay only 93.3 percent of the fees they agreed to in the treatment presentation compared with 96 percent in 1996. The ADA has published data showing that office overhead as a percentage of production has risen slightly in the recent, more difficult years.[16] The ratio of office expenses to gross billings moved up from 58.4 percent in 2006 to 59.3 percent in 2011. This is most likely a result of a steeper decline in gross billings than increases in office expenses.

Through the 1950s and 1960s, dentists worked about 47 hours per week. Today, they are in their offices approximately 36 hours per week.

From 1993 until 2005, there was an average of 1,904 Americans per active private dental practitioner.[17] This was a steady period, with the extremes never rising or falling by more than 27 Americans. In 2005, a stair-step change occurred and a new patient-to-dentist ratio was established at 1,652. That is a sudden decrease of 15 percent in the number of patients per practitioner. Between 1990 and 2000 the U. S. population increased by 13 percent, while the number of graduates from dental schools actually declined by 1 percent. In the next decade, the number of Americans grew by 10 percent and the number of new dentists rose by 20 percent.[6,9]

At the same time, Americans, other than children, were not going to the dentist as often.[11] Only one in three Americans had visited a dentist during the previous year in 1950. By 1997, annual attendance had risen to 66.4 percent for adults 21 to 64 years of age and to 74.4 percent for seniors. By 2010, ground had been lost in both groups. Average annual attendance for adults was 61.8 percent and for seniors 69.6 percent, a decline of 7 percent in both cases.

Beginning in 1988 and every year thereafter until 2002 when the cycle changed to three years, the Gallop Organization polled Americans on the question "Do you trust dentists to have your best interests at heart?" During the period of solid economic gain for general dentists (1988 to 2006), the percentage giving a favorable response rose from 51 percent to 62 percent.[18] Three years later, the trend closely paralleled the drop in dentists' incomes and fell to 58 percent.

Fees

If dental expenses are rising faster than the general economy, we should see signs of fragmentation in the market. A perfect market will adjust to balance supply and demand. If fees become dissociated from the value of services, the market will become lumpy.

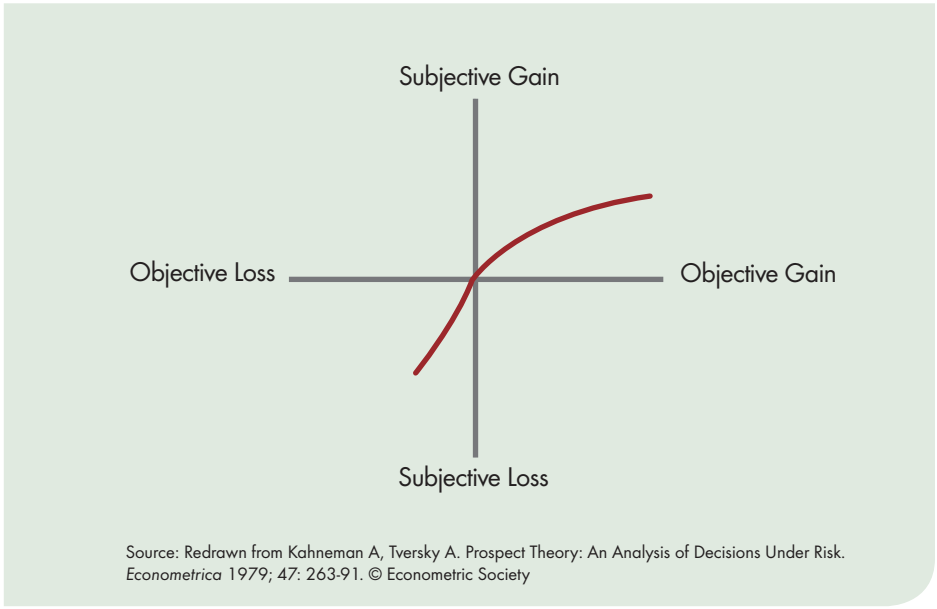
Setting the CPI for both dental services and goods and services in the economy generally at 1.0 in 1984, it is interesting to learn the relative change in each. The overall economy grew at a rate of 2.25 from 1984 to 2011. The dental CPI grew at 4.08.[6] Dental charges to the public increased 80 percent faster than expenses in other areas. Under such circumstances, it is expected that individuals with the least disposable income and the worst oral health will be more likely to exit the market. Fragmentation may also occur among providers, with dentists who are capable of attracting high-paying patients earning more, thus contributing to a growing income gap among professionals.

Both effects can in fact be observed in the data. Several reports, such as the *Surgeon General's Report on Oral Health in America*, have called attention to growing oral health disparities.[19] The less well known effect is occurring among dentists. As shown in **FIGURE 2**, the earnings among general dentists at the 75th percentile are now more than 2.5 times the earnings at the 25th percentile, and the difference is increasing. This fragmentation may make it more difficult for organized dentistry to speak with a single voice for the entire profession or to develop policy that is universally accepted.

How Does It Feel?

The information presented to this point has been expressed in dollars or various combinations of dollars, such as average income and rate of growth. But dollars are rubber numbers — they do not hold their shape very well, depending on one's perspective.[20] The apparent size of the dollar seems to be larger when it is seen leaving than when it is arriving.

The recent downturn or flattening in dentists' incomes is felt in a different way from previous, larger increases. Behavioral economics can be used to explain the relationships between dollars and "felt dollars."



Source: Redrawn from Kahneman A, Tversky A. Prospect Theory: An Analysis of Decisions Under Risk. *Econometrica* 1979; 47: 263-91. © Econometric Society

FIGURE 4. Relationship between objective and subjective sense of gain and loss.

Daniel Kahneman and his associates received the 1994 Nobel Prize in economics for giving us a clearer notion of the relationship between objective and subjective views of monetary gain and loss.[21] The general name for his view is "prospect theory," as in "what are your prospects for the future?" Kahneman's basic insight is summarized in **FIGURE 4**. Focus first on the upper right quadrant where objective and subjective gains are depicted. Every additional objective "dollar" bumps up subjective satisfaction. But the rate of return diminishes, so that it takes more dollars to keep the ball rolling at a steady pace. This could explain why high-end patients are willing to pay outsized fees for treatments that produce marginal improvements in oral health compared with care in the middle of the fee schedule.

Richard Thaler,[22] who shared the Nobel Prize with Kahneman, is famous for a sequence of experiments showing that students in economics classes who had been given University of Washington mugs were only willing to sell them for about twice what they would be willing to pay to get an additional mug, even when they were given the mug as a gift in the first place. The sense of possession strongly overrides the sense of objective value: this is called the endowment effect.

The same curve works in the opposite direction for losses, as shown in the lower left of **FIGURE 4**. There are two important differences between the curves on the gain side of the ledger and those on the loss side. First, the rate of felt loss is much more dramatic than the rate of felt gain. Most of us are risk-averse. We would turn down an exchange of a sure $100 for even chances to win either $200 or nothing. We need a little reassurance; say, paying $95. That is how the bond market works. But on the loss side, the curve is steeper. Generally, changes in losses are evaluated at from 2 to 2.5 the rate of change in gains. A loss of $50 is usually felt to be comparably worse than a gain of $100 or even $125 is felt to be good. This means we tend to gamble more to avert potential losses than to win potential gains — they mean more. That is why patients without disease will pay for routine services while nonpatients with horrible oral conditions are willing to pay only a little or nothing.

The second characteristic depicted in the lower left quadrant is the shorter line. Losses are truncated. There is no upper limit on financial gains in the United States, but there are boundaries on what one can lose. Creditors and bankruptcy courts see to that. There are some very significant ethical issues that hang on this asymmetry. The bad odor attached to bailouts can be traced to the arrogance of playing with other's money with a virtual unlimited upside prospect and a stop-loss guarantee on the downside. Many nonpatients reason that they will take their chances on poor oral health and go to the emergency room on public assistance if they are unlucky. From the economic perspective of society, this bailout just does not make sense.

Patients probably have no notion of dental overhead, the cost of dental education and the expenses associated with OSHA and other compliance requirements that dentists face. That does not prevent them from forming personal opinions about what costs are fair. Behavioral economics also has some useful things to say about what the public regards as fair business practices.

The best lead on this is the work of Jack Ketch in the 1980s.[23,24] The public was asked what it thought about various practices, such as passing on business costs to consumers and profiting from changing market conditions. A typical question was whether it was deemed fair for a hardware store to raise the price of a snow shovel from $15 to $20 in the few days following a snowstorm. Raw economic theory says, "go for it." The public might grudgingly pay, but 82 percent of them will call it greed. Think of the University of Washington mugs and patients of record when considering the next example from the research. A firm that is doing well pays workers in a certain classification $9 an hour. Because of an economic downturn in the area, other employers are now hiring this kind of employee at $7 per hour. Among the public, 83 percent would regard it as unfair to reduce the wages of the current $9 employees, but 73 percent see nothing objectionable in paying new hires $7. Firms that suffer uncontrolled increased costs due to new safety regulations were felt to be entitled to pass those costs on to customers. Similarly, firms that developed improved products and procedures were entitled to benefit from them. But poor management and heightened vulnerability of the customer were seen as protected territory. Attempting to sell more than the customer feels he or she needs is also resisted on ethical, in addition to economic, grounds.

Conclusion

Although the typical general dentist is economically well situated, there are reasons for feeling somewhat victimized by circumstances. The past several years have forced a "correction" on the profession. The contraction of incomes has not fallen evenly across all dentists. The top tier continues to flourish. It is certainly the case that the situation would be more easily tolerated if educational and practice debt were to abate, if fewer dentists were being trained, if insurance companies would ease constrictions on coverage and if the economy were to pick up faster.

An alternative way of seeing the data suggests that dentistry is undergoing deep structural changes. Among the elements in play are potential for leveraging the productivity of auxiliaries, greater diversity in practice ownership and employment, segmentation of services with greater differences between high-end, nonhealth practices and the traditional family practice, service outlets that do not expect to establish long-term personal relationships with patients and safety-net providers. One way to read the data is to see that it is becoming increasingly difficult to sustain the practice model of the 1980s. ■

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CDA JOURNAL, VOL 42, N°5

Morale: Creating a Unified Group

Kyle Mercer

Morale is the capacity of a group of people to pull together persistently and consistently in pursuit of a common purpose. — Alexander H. Leighton

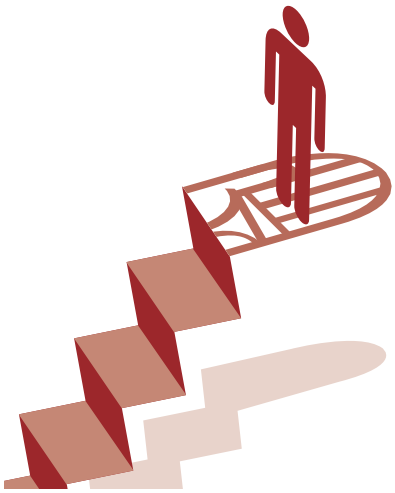
Morale is the single most important factor in the productivity and well-being of a practice. Doctors spend a lot of energy trying to make their teams happy, but happiness is not the same as morale. Often, trying to make a team happy results in a strange working dynamic that can be frustrating.

Morale is how we draw a group of people together to accomplish something. To do this, *the group must feel unified, believe in what it is doing, feel that it is good at it and trust that its efforts are unique in some way.*

Create a Unified Group

Pulling a team together requires a process to resolve conflict in a way that is satisfying to all parties. This of course falls to the doctor because he or she is the leader, and the leader must be someone who will address conflict in the team, a person the team can trust and who has resolution tools. To begin with, you may need the courage to help the team clean up any accumulated baggage from the past.

A second challenge that I often see is what I call the front/back divide. Invariably, a team tends to divide along the lines of whatever area of the practice they work in. In some offices, there is actually a line between carpet and hard floor. This line creates a lot of conflict, so finding a way to reduce this division can go a long way toward creating a unified team.



Believe in What You Are Doing and Embrace Your Uniqueness

Secondly, a team comes together under shared values. Identifying and agreeing on values is one of the primary unifying factors for groups throughout history. If you can solidify values within your team, you will make significant progress toward creating a potent team.

Try this: Have a meeting and ask everyone to brainstorm about the professional values of the practice. Write them all down on a whiteboard. Once you have a long list, give everyone four votes. Have them come up to the board, all at the same time, and vote for their top picks. When you tally the votes, you might find that you can combine a couple of concepts. Then, by picking the top five, you will have established the shared values of the practice. Post these where everyone can see them. Patients love to see them, too.

Believe That You Are Good

Excellence pulls people together. Find something you are great at and emphasize it. Have the team members recognize their excellence, encourage further excellence and let patients know that excellence is your specialty. Maybe the group is amazing technically, or it makes people feel safe or maybe the team's specialty is an energy of happiness or efficiency. Brand your team with a particular character. Everyone will feel closer, and the practice will attract patients who love how you do it.

Morale Mistakes

Many dentists try to create morale by giving their team bonuses, parties, time off, etc. These should not be used to create morale. In fact, this kind of strategy actually undermines morale if the benefits aren't earned. Rewards should be the outcome of morale and success. Of course, it is great to reward excellence, but morale cannot be bought. True morale comes from working together and achieving group success.

Ultimately, the team is a reflection of the leader. When the leader blames the team for morale issues, it undermines morale. It is the leader's responsibility to set the conditions for success. There is no replacement for exploring one's own development and fostering the ability to lead. The first step for every leader is to embrace the above suggestions personally, even before inviting the team into the new model. ■

Kyle Mercer is an executive coach and creator of the Inquiry Method, a depth process for transformational healing and living. He offers group and one-on-one coaching to dentists and other professionals.

CDA JOURNAL, VOL 42, N°5

Addressing Interoffice Dating

TDIC Risk Management Staff

Interoffice dating can be tricky. Potential landmines include sexual harassment claims, allegations of favoritism, low morale, breakup drama and decreased productivity that can affect the entire dental office, especially if a workplace relationship goes bad.

Legal and human resource experts across the board look at office dating in two ways: between coworkers and within the "chain of authority," such as a manager or practice owner dating an employee. The latter carries additional risk.

As practice owners, dentists ideally want employees to perceive them as advocates for their well-being and not as managers of their personal interactions.

To help prevent a problem before it arises, The Dentists Insurance Company recommends a policy defining the consequences of interoffice dating among employees. The policy should include expectations that an office relationship is separate from the work environment and should outline appropriate behavior, such as banning public displays of affection and retaliation if the relationship ends. Prohibiting the use of office email for personal communication also helps employees stay focused on work.

Interoffice dating guidelines can be used in place of an "antifraternization policy," which may be difficult to enforce. As practice owners, dentists ideally want employees to perceive them as advocates for their well-being and not as managers of their personal interactions. Additionally, some state laws restrict an employer's ability to regulate employee relationships unless they involve a conflict of interest.

Experts concur that the most important aspect of an interoffice dating policy is the office's sexual harassment policy. A written sexual harassment policy is essential for defining and forbidding inappropriate behavior. Harassment occurs when one employee indicates no interest, yet unwanted attention from another employee continues. Provide information about the consequences of such behavior on continued employment. The sexual harassment policy should be part of the employee manual and include a document that employees sign to indicate they understand and will honor the policy.

The second type of office dating occurs when a manager or practice owner has a relationship with an employee who reports to him or her. This relationship carries the additional risk of allegations such as favoritism, coercion or harassment,

CONTINUES ON 343

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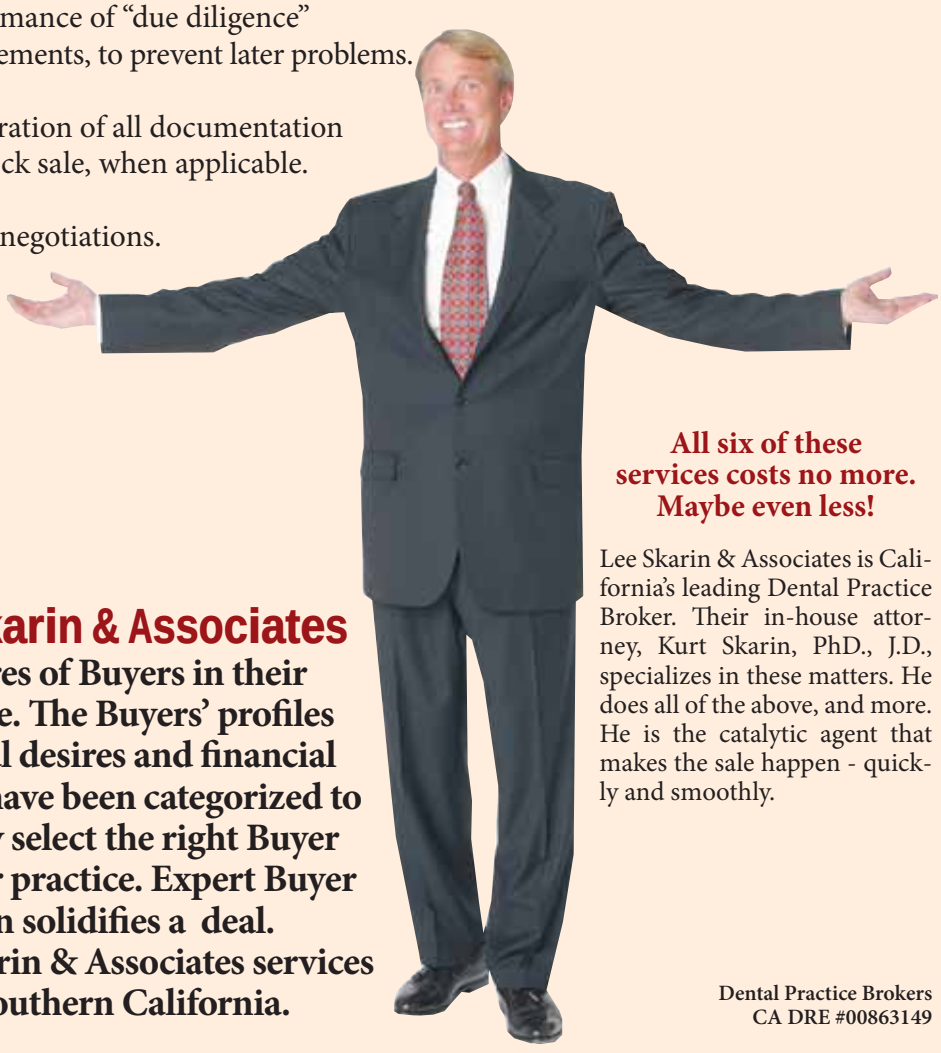

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ANAHEIM: General Dentistry Practice. 3 Ops. Modern. Dr retiring. GR $423K w/Adj Net of $140K. Growth potential! #CA101 – In Escrow

BAKERSFIELD: General Dentistry Practice. 8 Ops, 7 equipped. 3,650 sq. ft. Digital X-rays, Intraoral camera. 2013 GR $1.3MM w/ Adj Net $431K. Growing area! #CAM554

BAKERSFIELD and SMALL FARM COMMUNITY: Two Practices 30 mins. apart. Strong patient bases. Staff and doctor work both practices. Underserved communities. Room for growth. GR $588K w/Adj. Net $278K. #CAM557

BISHOP: General Dentistry Practice & Building. 5 Ops. 1,800 sq. ft, 2011 GR $1MM w/Adj. Net $387K. #14390 – In Escrow

CENTRAL COAST: Prosthodontic Practice. 4 Ops. Full in-house lab. Near shopping. 2012 GR $1.1MM+. #CAM535

CHULA VISTA: General Dentistry Practice. 4 Ops. 3½ Days hygiene/week. Dentrix. 2012 GR $528K. #CA109.

CLAREMONT: General Dentistry Practice. 6 Ops, 8 Days hygiene/week. GR $581K w/ Adj. Net $147K. #CA114 – In Escrow

COALINGA: General Dentistry Practice. 3 Ops. 1,100 sq. ft. 1,000 active patients. Excellent opportunity for new dentist or established dentist looking for satellite office. #CA564

COASTAL ORANGE COUNTY: General Dentistry Practice. 4 New high-end Ops. Dentrix, Dexis, Digital Pan. Close to the ocean. 2011 GR $600K+, 2012 GR $500K+. Dream location! #CAM566

COASTAL ORANGE COUNTY: Periodontal Practice. 5 Ops. 4 Days hygiene/week. 2012 GR $450K+. Great location near freeway/hospital. #CAM533

FOLSOM/EL DORADO HILLS: General Dentistry Practice. 4 Ops. 1,200 sq. ft. 2½ Days hygiene/week. Dentrix, Laser, Digital X-rays, Intraoral camera. 2012 GR $405K. #CA103

FREMONT: 10 Ops. 3,000+ sq. ft. Digital X-rays, Pan. 4,000 active patients. PPO/HMO. 12 GR $1.2MM w/ Adj Net $300K. #CA553

FRESNO: General Dentistry Practice and Building. 3 treatment Ops, 2 hygiene Ops with space for 3 add'l Ops. 20 New patients/month. 5½ Days hygiene/week. 2013 GR $708K. #CA144

GREATER SACRAMENTO: Orthodontic Practice. Like-new 2,300 sq. ft. office with extensive leasehold improvements and 6 chairs. 220 active patients, Phase 1. #CA551

GREATER SACRAMENTO: General Dentistry Practice and Condominium. 4 Ops, 1,300 sq. ft. Prof. bldg. Eaglesoft software, Fiber Optics. 2013 GR $679K. Owner retiring. #CA138

GREATER SACRAMENTO: General Dentistry Practice. 7 Ops. 3,079 sq. ft. Digital X-ray, Pano, Datacon software. 2013 GR $974K w/ low overhead. #CA140

GREATER SACRAMENTO/ ROSEVILLE: General Dentistry Practice. 6 Ops. 2,200 sq. ft. Prof. bldg. Panorex, CAD/CAM, Laser, Eaglesoft software. 2013 GR $966K w/low overhead. #CA143

GREATER SACRAMENTO/ ROSEVILLE: Partnership Position in General Dentistry Group Practice. Intraoral, Digital X-rays, Dexis, Digital Pan. Owner financing w/acceptable down payment. Subject to approval by current partners. #CA126

HAWAII (MAUI): General Dentistry Practice. 4 equipped Ops, 1,200 sq. ft. GR $636K #20101

HOLLISTER: FACILITY ONLY. 3 Ops w/2 add'l plumbed. 1,800 sq. ft. Dexis, Easy Dental, Pano X-ray. Owner relocating to own building. #CA563

HUNTINGTON BEACH: General Dentistry Practice. 5 Ops. Spacious.

HUNTINGTON PARK: Large Group Practice. 15 Ops. Dentrix, Dexis, E4D, CAD/CAM. 2012 GR $1.1MM+. Seller owns bldg. Dr retiring. #CA113

INDIAN WELLS: General Dentistry/ TMJ Practice. 6 Ops. 4,000 sq. ft. 2011 GR $350K+ on 1 Dr day/week. #CAM530

LA MESA: 3 Ops. 2,000 sq. ft. Prof. bldg. Dentrix, Laser, Digital X-rays. 2012 GR $396K w/ Adj. Net $155K. #CA127

LANCASTER: General Dentistry Practice. 4 Ops. 2,300+ sq. ft. GR $676K w/ Adj. Net $174K. #14376 – In Escrow

LOS ANGELES: General Dentistry Practice. 5 Ops. Prof bldg. downtown. 2013 GR $225K. #CA141

NEWPORT BEACH: General Dentistry Practice. 3 Ops. Newer high-end equipment. 2012 GR $350K (3½ days/wk). #CAM534

NORTH EAST BAY: General Dentistry Practice. 7 Ops. 2,324 sq. ft. Dental Mate software, Intraoral camera, Pano X-ray, Digital X-ray. 2012 GR $885K. Bldg to be sold with practice. Owner retiring. #CA108

NORTH OF SACRAMENTO: General Dentistry Practice. 4 equipped Ops, 5 avail. 20 Hours hygiene/wk. Approx. 1,500 active patients. EZ Dental, Pan, Fiber Optics. 2012 GR $515K (32 hrs/wk). Bldg avail. for purchase. #CA558

NORTH OF SACRAMENTO: General Dentistry Practice. 4 Ops. 1,650 sq. ft. 2012 GR $521K. Low overhead of 52%. #CA528

NORTH OF SACRAMENTO: General Dentistry Practice. 5 Ops. 2,050 sq. ft. Dentrix, Intraoral camera. Digital X-ray, Imaging system, Pano. 2012 GR $1.2M+ w/ low overhead of 54%. #CA106

NORTH ORANGE COUNTY: Endodontic Practice. 5 Ops. 3 Zeiss wall-mounted microscopes. GR $370K w/Adj. Net $172K (3 day/wks). #CAM561

ORANGE: 2 Equipped Ops, 2 Add'l plumbed. Specializes in Dentures and Partials. Retail location. 2013 GR $279K w/Adj. Net $125K. #CA142

ORANGE COUNTY: General Dentistry Practice. Retail location. 2013 GR $900K+ w/ Adj. net $393K. #CA132

PITTSBURG: General Dentistry Practice. 5 Ops. 1,400 sq. ft. Pano, Fiber Optics. 12 New patients/month. 3-Year avg. GR $236K w/60% overhead. Dr retiring. #CA133

REDONDO BEACH: DECEASED DOCTOR - General Dentistry Practice. 3 Ops, 2 equipped, 1 plumbed. 700 sq. ft. Busy corner location. Walk to ocean. #CA147

RIDGECREST: General Dentistry Practice/ Building. 4 Ops. 1,500+ sq. ft. 2012 GR $175K. #CA523

RIVERSIDE: General Dentistry Practice/ Building. 5 Ops. Emphasis on Implants. 2012 GR $500K+ #CA120 – In Escrow

S. LAKE TAHOE: General Dentistry Practice. 5 Ops, 1 Add'l avail. 1,450 sq. ft. High visibility. 15 New patients/month. 4 days/hygiene. Avg. collections over last 3 years $733K. #CA134

S. ORANGE COUNTY: General Dentistry Practice. 4 Ops. 1,350 sq. ft. Coastal location. Dentrix. #CA119 – In Escrow

SAN BERNARDINO: General Dentistry Practice. 4 Ops. 30+ Years goodwill. GR $265K the last 3 years. Dr retiring. Great office location w/ Great potential.

SAN CLEMENTE: General Dentistry Practice. 3 Equipped Ops, 2 Add'l plumbed. PracticeWorks, Digital X-rays, Pano. Established approx. 10 years. #CA129

SAN DIEGO: General Dentistry Practice. 5 Ops. 1,200 sq. ft. EagleSoft, Digital X-rays, Established 22 years. 2012 GR $442K w/Adj. Net $161K. #CA130

SAN JOSE: FACILITY ONLY! 6 Ops. 3,700 sq. ft. Digital X-ray, Sterilization, Computer workstations. Reception w/ flat screen TV. Equipped business office/ conference room. #CA565

SANTA ANA: General Dentistry/Pedo/Ortho Practice. 11 Ops. Free-standing bldg. Pano, Intraoral camera. 2013 GR $424K w/Adj. Net $138K. Denti-Cal makes up approx. 35% of business. #CA136

SANTA CRUZ: Endodontic Practice. 2 Ops. 850 sq. ft. Schick Digital X-rays, Ideal for a satellite practice. GR $350-$400K. 55% Overhead. #CA102 SOLD

SANTA CRUZ COUNTY: General Dentistry Practice. 3 Ops. 1,100 sq. ft. Prof. bldg. near Hwy 1. 2,200 Active patients. Schick Digital X-ray, Dentrix software. GR $338K 2 days/wk. Moving. #CA550

SHERMAN OAKS: General Dentistry Practice. 4 Ops. Near prof. bldg near freeways. SoftDent. 2012 GR $740K w/ Adj. Net $220K. #CA135 – In Escrow

SOUTH COUNTY SAN DIEGO: General Dentistry Practice/Building. 4 Ops. Bldg is free-standing w/1200 sq. ft. 2013 GR $310K on 150 days worked. Dr retiring. #CA148

THOUSAND OAKS: FACILITY ONLY! Move-in ready. 4 Ops. 1,325 sq. ft. Modern design. Dentrix, Equipped business office. Great start-up location/satellite office. #CA137

TURLOCK: General Dentistry Practice. 2012 GR $[illegible]+ w/Adj. Net $443K. #CA506 SOLD

TUSTIN: General Dentistry Practice. 3 Ops. CEREC 3D Machine. GR $300K w/Adj. Net $103K. #CA131 – In Escrow

VICTORVILLE: General Dentistry Practice. 3 Equipped Ops, 3 Add'l plumbed. 2,150 sq. ft. SoftDent. 2013 GR $313K w/Adj. Net $147K. #CA149

WALNUT CREEK: PRICE REDUCED! Prosthodontic Practice. 3 Ops. Full lab. 2013 GR $399K w/Adj. Net $143K. #CAM540

WEST LOS ANGELES: General Dentistry Practice. 4 Equipped Ops, 1 Add'l plumbed. Great location. GR $342K on 2 Doctor days/wk. Room to grow! #CA117

WEST LOS ANGELES: General Dentistry Practice. 3 Ops. Emphasis on Perio/Implants. Pano, ComputerAge Software. 2013 GR $795K w/Adj. Net $371K on 4 days/wk. #CA145

YORBA LINDA: NEW LISTING! General Dentistry Practice. 4 Equipped Ops, 1 Add'l plumbed. Prof. bldg. 4 Days of hygiene/wk, EagleSoft, Digital. 2013 GR $914K w/Adj. Net $301K. #CA146

YORBA LINDA: General Dentistry Practice. 5 Ops. Great location. Laser, Intraoral camera, Digital X-rays. 3 Hygiene and 3 Doctor days/wk. #CAM531

CONTINUED FROM 340

and it requires practice owners to take extra steps to prevent liability. In this instance, TDIC recommends a written consensual relationship disclosure.

The disclosure should state that a voluntary and mutually consensual relationship exists and that either party can end the relationship at any time. Both parties agree that, should the relationship end, the breakup will not be allowed to negatively impact the performance of duties. The disclosure must require a review of the office's sexual harassment policy and acknowledge that the relationship is not a condition of employment or a promise or threat regarding employment. Employees cannot be required to sign the disclosure and should be advised of their right and responsibility to have a lawyer review it.

TDIC strongly advises practice owners to carefully consider their leadership role and weigh the potential consequences of entering into relationships with employees.

If a dentist and an employee decide to enter a relationship, it is important for them to handle the situation professionally from the beginning. The dentist should first discuss the situation with practice partners or associates. Concealing the relationship from partners, associates and other staff typically is not successful and can lead to the perception that the relationship is inappropriate. ■

The Dentists Insurance Company offers policyholders a free advice line at 800.733.0634 for assistance with questions or concerns about potential liability. TDIC risk management analysts will work with policyholders to develop a solution.

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IN-211 MODESTO: **Seller Motivated!** Located in a single story, multi-unit Professional building, 1,500 sf w/ 4 ops. **$230k**

IG-247 ATWATER: Stunning practice! Cash flows well and profits better than most! 1090 sf w/ 3 ops. State of the Art & Top of the Line! **$645k**

JN-251 FRESNO: Dedicated to delivering the highest quality of care! ~ 1,565 sf w/ 4 ops. **$140k**

JN-254 FRESNO: "Retro-vintage-designed". All this practice needs is you! Office is ~ 2,159 sf w/ 4 ops. **$140k**

JN-259 FRESNO Facility: **Newly Remodeled!** Low rent & overhead would cost much more to duplicate! ~ 1,197 sf w/ 3 ops + 1 add'l. Seller Motivated! **$45k**

JG-261 TULARE CO: Family-oriented practice in desirable locale! Seller willing to stay for transition! 730 sf w/ 3 ops **$325k**

SPECIALTY PRACTICES

DC-246 PLEASANTON Pediatric: Highly Motivated Seller! Pediatric Practice/Facility Only. 1700 sf w/ 4 ops. Plumbed for additional ops. **Practice $325k or Facility only $250k**

I-7861 CENTRAL VALLEY Ortho: 2,000 sf, open bay w/ 8 chairs. Fee-for-Service. **$370k**

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

EN-203 SACRAMENTO Oral Surgery: This highly efficient office occupies ~ 3,000 sf w/ 4 fully equipped ops **$325k**

GN-209 SACTO VALLEY Endo: 1,400 sf w/ 3 ops **$350k**

BC-230 CENTRAL CONTRA COSTA Perio: Loyal patients @ 2 locations! **$650k**

EG-225 SACRAMENTO Ortho: Well-maintained, single-story Medical/Dental complex. 1,200 sf w/ 4 chairs **$95k**

DN-229 EAST BAY Endo: Strong referral & patient base. Attractive tree-lined street, mature landscaping and curb appeal. High foot traffic. 975 sf w/ 2 ops **$245k**

DG-264 SAN JOSE Ortho: $300-400k in build-outs alone! 1800sf w/ 5 chairs. **ONLY $270k**

ASK THE BROKER

I'm concerned about confidentiality when selling my practice. What is the best time to tell my staff and patients?

Normally, most doctors do not inform the staff until we have a signed contract, a signed lease, and financing in place to complete the purchase. We usually try to have all these important elements in place at least two to three weeks prior to close, but for many reasons, these key elements may not come together until just before the closing date.

It may seem harsh to attempt to keep the staff out of the picture until the end, but it is similar to a single mother not introducing multiple possible future prospects to her children until she is sure he is the right one! The staff will be alarmed about the change, but explaining that they are especially important in the transfer of goodwill of the practice usually alleviates their concern of possibly losing their jobs. We strongly advise the new doctor to maintain the same staff with their current pay and benefits.

If the staff begins to suspect the sale, we advise the doctor to inform the staff. Again, they must be informed as to why they are so critical in the transition process and why they are not in danger of losing their jobs. Telling white lies to a suspecting staff will often create ill feelings and create resentment when they are finally informed. For the same reasons stated above, we still advise keeping all the possible buyers from the staff while meeting with the interested buyers after hours. Unfortunately, any call to the office from an unfamiliar doctor might create a buzz of suspicion.

If the doctor has a long-standing relationship of trust with the staff and has always included them in his executive decisions regarding the office, he may decide to consult with them from the onset of his decision. Many times the doctor does not know how to run any of the management programs in the office computer. Informing the staff early actually makes the broker's job easier as key staff members can be contacted to retrieve vital information regarding the practice. As always, inform the staff of their importance in the process as it is still necessary to alleviate their fear of change.

Timothy G. Giroux, DDS is currently the Owner & Broker at Western Practice Sales and a member of the nationally recognized dental organization, ADS Transitions. You may contact ***Dr Giroux at***: wps@succeed.net or 800.641.4179

CDA JOURNAL, VOL 42, N°5

Required Notifications and Disclosures

CDA Practice Support

As a regulated profession, dentistry is obliged to provide certain notifications and disclosures to the public as well as to patients. Many of the requirements are also requirements of other health professions. This article does not include required employee notifications and disclosures.

Notice of Licensure

Post the notice of licensure accessible to public view in all facilities where dental services are provided. The notice must state, in 48-pt type:

NOTICE
Dentists are licensed and regulated by the Dental Board of California
877.729.7789
www.dbc.ca.gov

Name, License Type and Academic Degree

Comply with the requirement to notify patients of clinical staff names, licenses and academic degrees by doing each of the following:

1. Have clinical staff wear nametags or post their licenses or certificates.
2. Post the name, license type and highest level of academic degree of each licensed individual prominently, or provide the information in writing in 24-pt type to the patient at the initial visit.
3. Display the name, license type and highest level of academic degree of each licensed individual prominently on the practice website.

Advertising

Advertisements featuring fees, discounts or dentures must include specific information. For details, refer to the article "Dental Practice Marketing and Advertising 101" on cda.org/practicesupport.

Dispensing

When dispensing medicine to a patient, you must provide a written disclosure that the patient has a choice between obtaining the prescription from you, the dispensing prescriber, or obtaining the prescription at a pharmacy of the patient's choice.

Commercial Credit

If you offer a patient commercial credit financing products (credit cards, lines of credit or loans), you must obtain the patient's signature on a written disclosure notice, provide a written treatment plan and comply with other requirements. Refer to "California Requirements for Dental Practices Offering Commercial Credit to Patients" on cda.org/practicesupport.

Dental Materials Fact Sheet

Provide the dental materials fact sheet to a patient at least once prior to performing a restorative procedure and obtain acknowledgment of receipt. The fact sheet is available on the Dental Board website, dbc.ca.gov.

Notice of Privacy Practices

Under the Health Insurance Portability and Accountability Act (HIPAA) of 1996, a HIPAA-covered entity, which includes most dental practices, must provide patients with a notice that explains the entity's responsibilities and patients' rights with regard to the use or disclosure of patient information and must obtain patient acknowledgment of receipt of the notice. The notice must also be posted at the entity's facility and on its website. When updating the notice, it is not necessary to obtain acknowledgment of receipt from current patients.

Beneficial Interest

When you refer a patient to an organization in which you or your immediate family have a significant beneficial interest, you must disclose this interest in writing to the patient and must advise that the patient may choose any organization for the purpose of obtaining the service ordered or requested by you. Such disclosure and advice must also be provided if you charge, bill or otherwise solicit payment from a patient on behalf of an organization in which you or your immediate family have a significant beneficial interest. The disclosure requirement can be met by posting a conspicuous sign or by providing the patient with a written statement.

Radiation

In areas where X-ray machines are operated, post a sign or signs that state:

CAUTION
X-RAY

Proposition 65

Businesses with nine or more employees must provide "clear and reasonable warning" prior to exposing any person to a chemical on the Proposition 65 list. Several chemicals used in dentistry, for example mercury, nitrous oxide and chloroform, are on the list. Refer to "Proposition 65 FAQ" on cda.org/practicesupport for more information and to download the required warning notices.

Business License

Many cities and counties require posting a business license in a conspicuous location. ■

Regulatory Compliance appears monthly and features resources about laws and regulations that impact dental practices. Visit cda.org/practicesupport for more than 600 practice support resources, including practice management, employment practices, dental benefit plans and regulatory compliance.

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3088 SAN JOSE GP & BUILDING

Offering well-est. practice and 20 year old, 3,500 sq. ft. professional building. Office space is 1,755 sq. feet with 4 fully-equipped ops. New laser, and Dexis digital x-ray, digital camera, intra oral camera, and panorex. Approx. 1,200 active pts. and 3.5 doctor days/week. Call for details.

PENDING

4022 PALO ALTO FACILITY

Premiere dental practice facility only located on the 1st floor of modern University Circle building in Palo Alto w/ convenient freeway access, ample parking + commuter shuttle service. This is a terrific opportunity for a practice in the heart of Silicon Valley blocks from downtown Palo Alto. Seller leaving the area and offering beautiful 3 op, 1,059 sq. ft., turn-key, fully-equipped office. Lease expires 2015, has 4 five year options to renew & is assignable. Asking $160K.

PENDING

4015 LOS ANGELES COUNTY GP

Quality East San Gabriel Valley, Foothill Community practice. Retiring seller working 4 doctor-days, approx. 1,600 active pts., seasoned & loyal staff. 1,103 sq. ft. modern office w/4 fully-equipped ops. Prominent, well-travelled street corner in desirable neighborhood surrounded by healthcare professionals with large daytime population draw. Recent equipment upgrades. New computers and new cabinets. 2012 GR $877K+ Asking $722K.

PENDING

3096 NORTH BAY PERIO

Step into quality practice with established referral base. 2,200 sq. ft. office w/6 fully-equipped ops. Modern facility kept updated with recently purchased chairs, units, Pano & lasers. Seller will grant a fair market lease and would consider selling the office space. 5 year avg. GR $1.2M+ Asking $825K.

PENDING

4013 STANISLAUS COUNTY GP

Well-managed GP with regularly increasing revenue. State-of-the-art 1,600 sq. ft. well-equipped office w/4 ops. Digital x-ray, Dexis, 4 x-ray machines, laser, pano and recent leasehold improvements. 2012 GR $883K+, 2013 on schedule for $968K+ as of Oct. Located near hospital in well-travelled area. Asking $604K+.

4007 FREMONT PERIO

Seller retiring from 30 year est. Periodontal practice in 3 op facility located in medical/dental building on well-traveled avenue in commercial neighborhood. Strictly Perio - no implants. Great starter practice opportunity, turnkey operation with equipment and no construction hassles. 2012 GR $133K+ w/just 1 Dr. day/week. Avg. 8 new pts. per month, 6 pts. per Dr. day & 7-8 pts. per hygiene Asking $75K.

SOLD

4011 SANTA ROSA GP

Seller is changing careers and offering a well-established and successful practice. No insurance contracts, 4 doctor day/week & attractive 1,700 sq. ft. office close to downtown. 2012 $576K+, 2013 on schedule for $612K+ as of June. Asking $450K.

SOLD

4014 SAN FRANCISCO GP

Seller has a sterling reputation throughout the community, and is ready to retire. Facility has 3 fully-equipped ops, reception area, business office, private office, lab + sterilization area, x-ray room, dark room + storage and bathroom. Asking $125K.

SOLD

4018 NAPA COUNTY GP

Seller retiring from a profitable, well-established Napa County practice w/large & loyal patient base. Located in 2,750 sq. ft. office w/6 modern fully-equipped & upgraded ops. including digital x-ray in each op. 2012 GR 1.7M+ & 2013 GR on schedule for 1.8M+ as of October. Asking $1.4M.

PENDING

3094 NORTH BAY PERIO

North Bay Perio now available. Seller retiring from well-est. practice with seasoned staff and active referral base. 1,300 sq. ft. very nice office with 4 fully- equipped operatories. 2012 GR $450K+ with just 3 1/2 doctor days and 5 days of hygiene per week. Great upside potential since owner does few implants. Asking $271K.

PENDING

4020 MID PENINSULA GP

Well est. practice with modern recently upgraded equipment in 2 op. facility. Located in professional & residential area close to downtown, convenient to 101, public transportation, shops, restaurants, and hospitals, in neighborhood known to the community for health care professionals. Asking $134K.

PENDING

UPCOMING:

SANTA ROSA GP

Contact Us:
Carroll & Company
2055 Woodside Road, Ste 160
Redwood City, CA 94061

Phone:
650.403.1010

Email:
dental@carrollandco.info

Website:
www.carrollandco.info

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Periscope offers synopses of current findings in dental research, technology and related fields

ORAL SURGERY

Obstructive sleep apnea

Boyd, B, Walters A, Song, Y, Wang, L. Comparative effectiveness of maxillomandibular advancement and uvulopalatopharyngoplasty for the treatment of moderate to severe obstructive sleep apnea. *J Oral Maxillofac Surg* 2013 Apr;71(4):743-51.

Objective: Obstructive sleep apnea (OSA) is a common disorder that affects 2 to 4 percent of the adult population. The gold standard treatment for OSA is continuous positive airway pressure (CPAP). However, many patients do not comply with this treatment due to its noise and discomfort. Surgical interventions have been used for patients who do not comply with CPAP therapy. This article compares the effectiveness of maxillomandibular advancement (MMA) and uvulopalatopharyngoplasty (UPPP), by themselves and in combination, for the treatment of moderate to severe OSA.

Materials and methods: This was a retrospective cohort study. A total of 106 patients were identified who met the inclusion and exclusion criteria: 18 years of age , apnea-hypoxic index (AHI) >15 (moderate to severe OSA), completion of CPAP titration, inability to tolerate or adhere to CPAP therapy, completion of MMA and/or UPPP and polysomnography performed prior to surgery and three to six months after MMA and/or UPPP. There was a nearly equal distribution of the 106 patients into three study groups: MMA (n=37), UPPP (n=34) and UPPP + MMA (n=35). The primary outcome measure was change in the AHI after surgical treatment. Secondary outcome measures included changes in low SaO_2 percentage and sleep quality.

Results: The outcomes from this study showed that MMA decreased AHI by an average of -40.5, UPPP/MMA decreased AHI by an average of -38.7, and UPPP decreased AHI by an average of -19.4. When compared to each other there was a statistically significant difference between MMA versus UPPP and UPPP versus UPPP/MMA. However, there was no significantly statistic difference between MMA versus UPPP/MMA.

Conclusion/clinical significance: This paper strengthens the argument for treating patients with moderate to severe OSA with maxillomandibular advancement.

— Dennis Yamashita, DDS

IMPLANTS

Bone's adaptive capacity

Greenstein G, Cavallaro J, Tarnow D. Assessing bone's adaptive capacity around dental implants: A literature review. *J Am Dent Assoc* April 2013 144(4):362-368.

Purpose: This literature review investigated bone's adaptive capacity to stress and the induced strain that implant-supported prostheses pose. Specifically, the authors wanted to understand concepts in the literature pertaining to bone adaptation that may account for high survival rates of prostheses that induce increased stress.

Method: The authors searched the literature to find studies that addressed bone's capacity to adjust to increased stress and strain. They assessed experimental and clinical trials in which investigators monitored healing after placement of dental implants.

Results: It is very clear from the literature and unfortunately from clinical experience that forces greater than the bone's adaptive ability can cause osseous resorption, leading to loss of osseointegration. However, it is possible that increased stress on prostheses initiates a reparative process resulting in retention of implants experiencing increased stress. Numerous lines of evidence support the concept that bone can modify itself to withstand increased mechanical forces. The concepts and lines of evidence include bone mechanotransduction, the ability of bone cells to detect and respond to stimuli; bone adaptation to mechanical stimuli; bone stresses and strains; threshold for bone loss, trying to understand the use of finite elemental analysis as it relates to bone adaptation or resorption; bone microdamage due to fatigue and microcracks and their relationship to stimulation of bone remodeling and creation during implantation; and healing, including callus formation and the proliferative response to stress around dental implants. A number of experimental studies are briefly cited, but the authors found no studies in the literature in which alterations of osseous density after implants were restored with any of the prosthetic constructs: cantilevered prostheses, angulated abutments, increased crown-to-root ratios or connection of teeth to dental implants. The final concept of remodeling and trabecular pattern around dental implants was also reviewed.

Conclusion: The authors present possible reasons for the success of prostheses that induce greater strain on bone and conclude that within a stress range bone adapts or remodels to accommodate

greater stress. Validation of these conclusions will require postsurgical and postrestorative micro-CT scans to show that increased stress/strain results in increased osseous density.

Clinical relevance: This is an important review to help investigators and clinicians understand the current concepts in bone response to dental implants, not only to keep pace with the complicated biology of bone and the more physical forces that apply to it and to the field of implant dentistry, but also to influence our thinking about how certain prostheses and the strain they produce can be understood and improved.

–David W. Richards, DDS, PhD

PEDIATRICS

Indirect pulp treatment

Rosenberg L, Atar M, Daronch M, Honig A, Chey M. Prospective study of indirect pulp treatment in primary molars using resin-modified glass ionomer and 2% chlorhexidine gluconate: a 12-month follow up. *Pediatr Dent* vol. 35/no. 1 Jan-Feb 13.

Purpose: The purpose is to determine the 12-month success rates achieved by indirect pulp treatment in primary molars when using a resin-modified glass ionomer (RMGI) liner and 2% chlorhexidine gluconate disinfecting solutions.

Methods: This prospective study was conducted at the New York University College of Dentistry. Approval was granted by the human subjects committee of the Institutional Review Board of NYU School of Medicine.

The subjects enrolled were healthy children ages 3 to 10 who were patients at the NYU pediatric dental clinic. Sixty teeth were selected and treated under the following inclusion criteria: absence of spontaneous pain, tenderness to palpation or percussion, absence of mobility and fistulas and absence of radiographic periapical pathosis. Preoperative periapical and bitewing radiographs were taken one month before indirect pulp treatment (IPT).

Standardized IPT procedure was performed. Caries-indicating dye was used to determine affected versus infected dentin. All infected dentin was removed and the preparation was air dried. All preparations were photographed for future reference. The preparation was disinfected with 2% chlorhexidine gluconate. A layer of resin-modified glass ionomer (Fuji II LC) was then placed on the floor of the preparation. A final restoration (composite or stainless steel crown [SSC]) was placed.

Follow-up visits occurred at three, six and 12 months. Only a clinical exam was conducted for the three-month follow up. Radiographs were taken and a clinical exam was performed during the six- and 12-month follow up.

Success was defined as lack of periapical and interradicular findings on the radiograph. Clinical success was defined as the absence of pain, mobility, percussion or palpation.

Results: The study began in 2005 and 39 subjects were enrolled. The mean age was 5 years and 7 months. There were more females (56 percent) than males. Equal numbers of primary first and second molars were treated. SSCs were placed in 37 teeth (62 percent) while Class I and II composite restorations were placed in 23 teeth (38 percent).

At three months, 50 teeth were available for recall and no treatment failure was noted. At six months, 41/42 (98 percent) were successful. At 12 months, 31/32 (97 percent) were successful.

Two teeth exhibited failures: one restored with SSC and another restored with composite. Both teeth were extracted.

Discussion/conclusion: Chlorhexidine is used as a disinfectant to rinse the remaining carious dentin. The RMGI has the ability to bond to enamel and dentin. It is biocompatible, releases fluoride and has a high potential to stimulate remineralization. The final restoration did not appear to play a key role in the treatment failures. The use of a caries indicator can be a useful tool in caries control. Appropriate case selection is important.

–Thomas S. Tanbonliong Jr., DDS

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6056 STOCKTON 3-op practice averages 13 New Patients per month. Collected $375,000 in 2013.

6055 VACAVILLE Strong reputation. 3-days of Hygiene. 3-ops. 2013 collected $568,000 on 3-day week. Profits totaled $240,000.

6054 TRACY Great launching pad waiting for opportunistic buyer. Best location. Beautiful 4-Op office. Digital and paperless. Part-time management collected $189,000 in 2013. Will do well with full-time attention. Full Price $125,00.

6053 SAN FRANCISCO'S SOUTH BAY – PEDO PRACTICE Long established. 2013 tracking $660,000 in production, $650,000 in collections and $255,000 in Available Profits. Great staff.

6052 BERKELEY Trendy north side shopping area. Very strong foundation. 2,000 active patients. 4-days of Hygiene. Beautiful hi tech office with great curb appeal. 2012 collected $590,000. Lots of work referred out.

6051 FRESNO'S FIG GARDEN VILLAGE AREA Not a Delta Premiere practice. Collected $430,000 in 2013 on 3.5 day week.

6050 MERCED 2013 trending $360,000. Very profitable. Refers Endo, OS & Perio. Not a Delta Premiere Practice. Great foundation to build upon. Full Price $125,000.

6048 SALINAS Great opportunity for the ambitious, Ideal for two Dentists. 10 days of Hygiene per week. 2012 collected $1.1 Million. 2013 tracking $1.2 Million. Practice did well during Great Recession.

6047 STOCKTON Best location outside Brookside Community on West March Lane. 2013 collected $535,000. Attractive 3-Op office. Package sale includes condo.

6046 PINOLE Collected $500,000 in 2012. 4-days of Hygiene produced $178,600. Beautiful office. Refers Endo. Lots of Goodwill here.

6043 EL SOBRANTE 3-day practice collected $184,000 in 2013. 3-ops. Building optional purchase. Full price $50,000.

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ANAHEIM $30,000/mth part-time. 6 ops, $30,000 invested in digital Dentrix upgrade & x-ray system. Full Price $220,000.

ANAHEIM HILLS Group member needed. GP has space to share with Specialist.

APPLE VALLEY – HESPERIA AREA Grosses $700,000+, nets approximately $350,000. 8 Ops. Can do $1 Million. Full Price $595,000.

BAKERSFIELD AREA Grossing $400,000. Full Price for practice & building $350,000.

BAKERSFIELD Grosses $800,000. 5 Ops. Successor should do $1Million. Low overhead. Full Price $500,000.

DENTURE CENTER Grosses $1.3 Million. Patients not given option for implants. Full Price $1 Million. Specialist can take to $2 Million.

HEMET Grosses $650,000 part-time. Will do $1,000,000. 10 op office. Full Price $585,000.

HMO 3 Practices grossing $6 Million. $52,000 cap checks/mth. One includes RE.

HUNTINGTON PARK 98% Hispanic. Grosses $600,000. Low overhead. 4-ops.

LANCASTER Proven hi identity location only. Seller needed more room. 2-ops. Full Price $55,000.

NEVADA RESORT AREA Grosses $600,000 on 3-days. Beautiful office. Needs more days. Full Price $600,000.

PASADENA AREA Grosses $900,000 part time. Did $1 Million+ with more time. Hi identity building also For Sale. REDLANDS Low overhead digital 4 Ops. Gross $300-to-$400K first year. Full Price $285,000.

REDLANDS Bank Repo! 4 Ops. Hi identity. Practice operating. Bargain at $285,000. Make Offer.

RIVERSIDE Grosses $860,000+. Can do $1.5 with right Buyer. Digital 10 Ops in hi identity center near Walmart. Full Price $800,000.

SAN DIEGO 4 Practices doing $2 Million. Absentee Owner. Buy one or all.

SAN FERNANDO VALLEY Part-time $300,000+. Full time will do $500,000. Building also available.

SAN FERNANDO VALLEY – BEST HISPANIC LOCATION 7 Ops & room to grow. 70 New Patients/mth. $2 Million location. Practice $1 Million, Building $1.75 Million.

SAN FERNANDO VALLEY HMO Grossing $1.6 Million. High end area where patients have discretionary income.

SANTA ANA Hi identity strip center. 3 Ops, low overhead, Grosses $200,000.

SOUTHERN CALIFORNIA $4.5 Million Gross. HMO. Prestigious hi identity.

SOUTH ORANGE COUNTY Two Practices, one Grossed $950,000 in 2013. One is beautiful 5 ops, other 5-ops in shopping center. Major employer across street.

TORRANCE - GARDENA Conservative Chinese DDS. Refers lots of work. Chinese/American Successor will do $600,000 first year. Bargain at $185,000.

YUCCA VALLEY Hi identity 600 sq.ft. 2 op building on .44 acres, zoned for additional home plus apts. Full Price $110,000.

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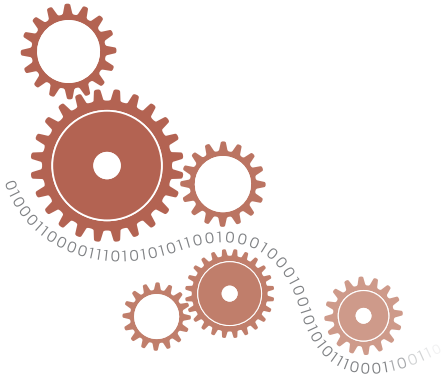


A look into the latest dental and general technology on the market

Quip (By Quip, Free)

Quip is a multi-platform collaboration tool that combines sharing, productivity and social features into a simple-to-use word processor. Once signed in, users can create their own word processing documents or import them from Dropbox, Evernote and Google Drive. The ability to upload local documents varies by device platform. The word processor interface contains basic functions that are familiar to any user when editing a document. All changes are immediately saved with the ability to revert to any previous version if needed. Files or folders can be shared with any individual or group of individuals using their email addresses. Quip automatically sends email invitations and when collaborators sign up, they are immediately able to view and edit shared documents. All shared users are able to see who has viewed or edited documents and when changes were made. Collaborators can know when someone is online and working on a shared document. They also can send group or individual messages to each other. Mentions can also be used in documents. One unified timeline brings all the power of social media together inside a team collaborative environment.

– Hubert Chan, DDS

CDA app (California Dental Association, Free)

To streamline information for members, CDA launched a new app in April. Available for download from the iTunes App Store and the Google Play store, the easy-to-use app is compatible with any smartphone operating on the iPhone or Android platform. It also is compatible with tablets that operate on those platforms, including the iPad. The app features a comprehensive and intuitive home screen that makes navigation seamless and it incorporates the functionality from the previously standalone *CDA Presents The Art and Science of Dentistry* app into the new, all-encompassing CDA app. The *CDA Presents* section offers attendees of the May 15-17 convention in Anaheim easy access to show schedules and speaker information, exhibitor and product listings, real-time alerts such as course availability, event photos and information on local hotels, restaurants and attractions. The new CDA app also includes sections for the latest industry and member news directly from CDA, practice support information and member surveys through the now-incorporated myCDAvoice. Download the new CDA app at cda.org/apps.

– Blake Ellington, Tech Trends editor

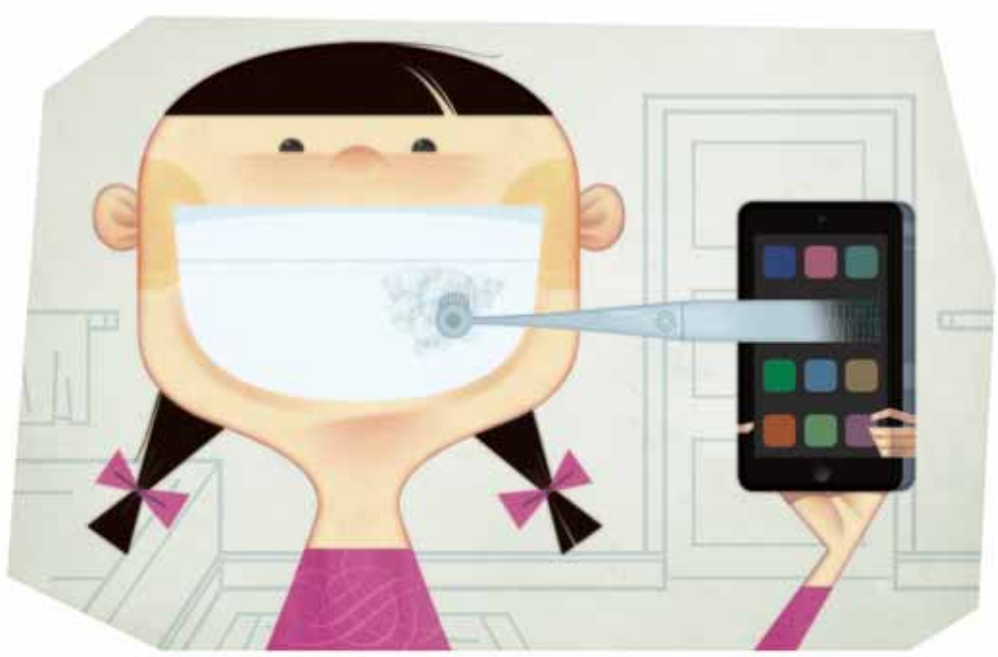
StackMotion (Flambe Studios, $1.99)

StackMotion enables users to isolate and extract specific subjects within photos, allowing them to superimpose onto various custom backgrounds. StackMotion does this via innovative image recognition technology. The superimposed subjects can be placed on still photos, videos and panoramas or formed into a slideshow of up to 100 images. Aspect ratio, size, position and orientation can all be adjusted per the user's desire. The new images can be filtered and set to music. Text can be added and the photos can be shared on social media sites or saved to the camera roll. StackMotion can be used to mimic the use of black intraoral photo contrasters, enhancing photos for use in case presentations, sharing cases amongst colleagues or for case documentation.

– Darien Hakimian, DDS

CDA JOURNAL, VOL 42, N°5

Internet Toothbrushing



Last year 102 billion apps were downloaded (91 percent of them free) and miraculously, they generated $26 billion.

Robert E. Horseman, DDS

ILLUSTRATION BY VAL B. MINA

I have them, you have them, every sentient human being from age 4 to barely functioning Anasazi like myself has them. This something is the "app." Prior to 2008 all we had was the "apt," which could have been one of three things: a place to live, a brief description of an individual's ability or a good guess about something that was likely to happen.

It was sometime in 2008, perhaps after a convivial session with the grape, when the term "application software" was shortened to "app" because it required 17 fewer keystrokes. Immediately, artists who didn't know application software from Tupperware, aptly created millions of colorful little icons. A coalition of artists, both brush-wielding and con, convinced Asian electronics manufacturers that decorating their mundane viewing screens with these little M & M-sized apps would create a worldwide bonanza of demand. Apple agreed.

And so, it came to pass. Last year 102 billion apps were downloaded (91 percent of them free) and miraculously, they generated $26 billion. All this happened because the public discovered that if you touched an app with your finger or your cursor arrow, you would be magically transported to a site that would take your money in exchange for an unseen product that might in the near future be dropped off right at your front door by a FedEx helicopter. Is that great, or what?

The best part is that your new best friend — your "PayPal" — will ante up for you for all this without your having to open your wallet!

Having convinced the public that anything from a boat tour on the Rhine to a Napa Valley wedding or a replacement showerhead was available at the touch of a finger, it was inevitable that innovative app-mongers would zero in on your personal hygiene activities. In Las Vegas, where information doesn't necessarily stay there as advertised, the Consumer Electronics Show dramatically debuted the Internet-controlled toothbrush.

To understand the enormity of this discovery it is necessary to review the history of the toothbrush. In Babylonia in 3,500 BC, "chew sticks" were all the go. Frayed on the end and rubbed vigorously about in the oral cavity, they sometimes cleaned the teeth slightly. The user could also enjoy any of the arguable benefits of "bloodletting," an early medical procedure that allowed demons to escape, taking their poxes with them. Apparently, the demons were happy to decamp, went forth and multiplied to the extent of holding public office or engaging profitably in entrepreneurial pursuits involving guns.

But the toothbrush was slower to evolve and it wasn't until the Tang Dynasty (619-907) in China that something resembling the modern toothbrush was made. The bristles were harvested from hogs living in Siberia and Northern China. Although the hogs never complained, the brush users did because the attachment of the bristles to the bone handles was tenuous at best. This was the beginning of planned obsolescence, a concept that has served industry well ever since.

From its early beginnings in China, the toothbrush slowly became accepted, so that by the 1920s, American dentists pushing the envelope of knowledge were recommending that each family member have *his or her own* toothbrush! In 1938 industry giant DuPont introduced nylon as a replacement for hog bristles.

Now parents can surreptitiously monitor not only their kids' TV choices and the peccadillos of their co-conspirators, but the tooth-cleaning efforts of their progeny as well.

This came as a welcome relief to millions of the nation's hogs who were getting peeved at having their bristles tweezed every two weeks after it was discovered that Nair left an unpleasant after-taste on the finished product.

So now, a decade into the 21st century, we are faced with an embarrassment of riches for tooth/gum maintenance. Manual brushes are being replaced by electric products and the contours and colors of the handle seem as important at the bristles. It is "time to reinvent oral care," states co-founder Loic Cessot of the French-based firm of Kolibree. "The idea is not to brush stronger, but smarter," he adds, and goes on to explain how the Kolibree toothbrush includes a sensor that detects how much tartar is being removed in a brushing. I think he means *plaque* unless the new brush also features a jackhammer app.

This idea is a long way from the old "chew on this red tablet for a few minutes, rinse and observe how much red stain remains on your teeth." Never mind the red stains that might be on your shirt, the basin and floor. Kolibree's brush also records brushing activity so users can attest to a consistent cleaning each time without resorting to a polygraph.

And wouldn't you know it, the brush wirelessly relays this information of your progress, or lack of it to … *a smartphone app*. Now parents can surreptitiously monitor not only their kids' TV choices and the peccadillos of their co-conspirators, but the tooth-cleaning efforts of their progeny as well. Heretofore, Cessot points out, "the only person who really knows is the dentist." It's bound to increase motivation and make the experience more fun, he said without specifying for whom.

To ensure this is apt to happen, former Microsoft and Google executive Thomas Serval plans to release the toothbrush worldwide in the latter part of the year with a price ranging from $99 to $200 depending on the model. We hope the advertising that will inevitably follow is the kind seen every day on TV imploring, "But wait! If you place your order RIGHT NOW, you will receive another brush absolutely FREE!" There is a minor shipping and handling charge for each item and an equally minor six-to-eight week delivery date. Not satisfied? Your tartar/plaque will be cheerfully refunded.

But, in any case, the app is free. Now, when you consider that every residence in the country is required by law to have one or more smoke detectors installed, why not connect — wirelessly, of course — the sensor in the brush with the smoke detector, so that a horrendous noise is emitted if your computer-savvy moppet tries to avoid his prescribed brushing?

If the local fire department is also wirelessly adjoined to your system, you might want to lay out some cookies. ■

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