OF THE CALIFORNIA DENTAL ASSOCIATION

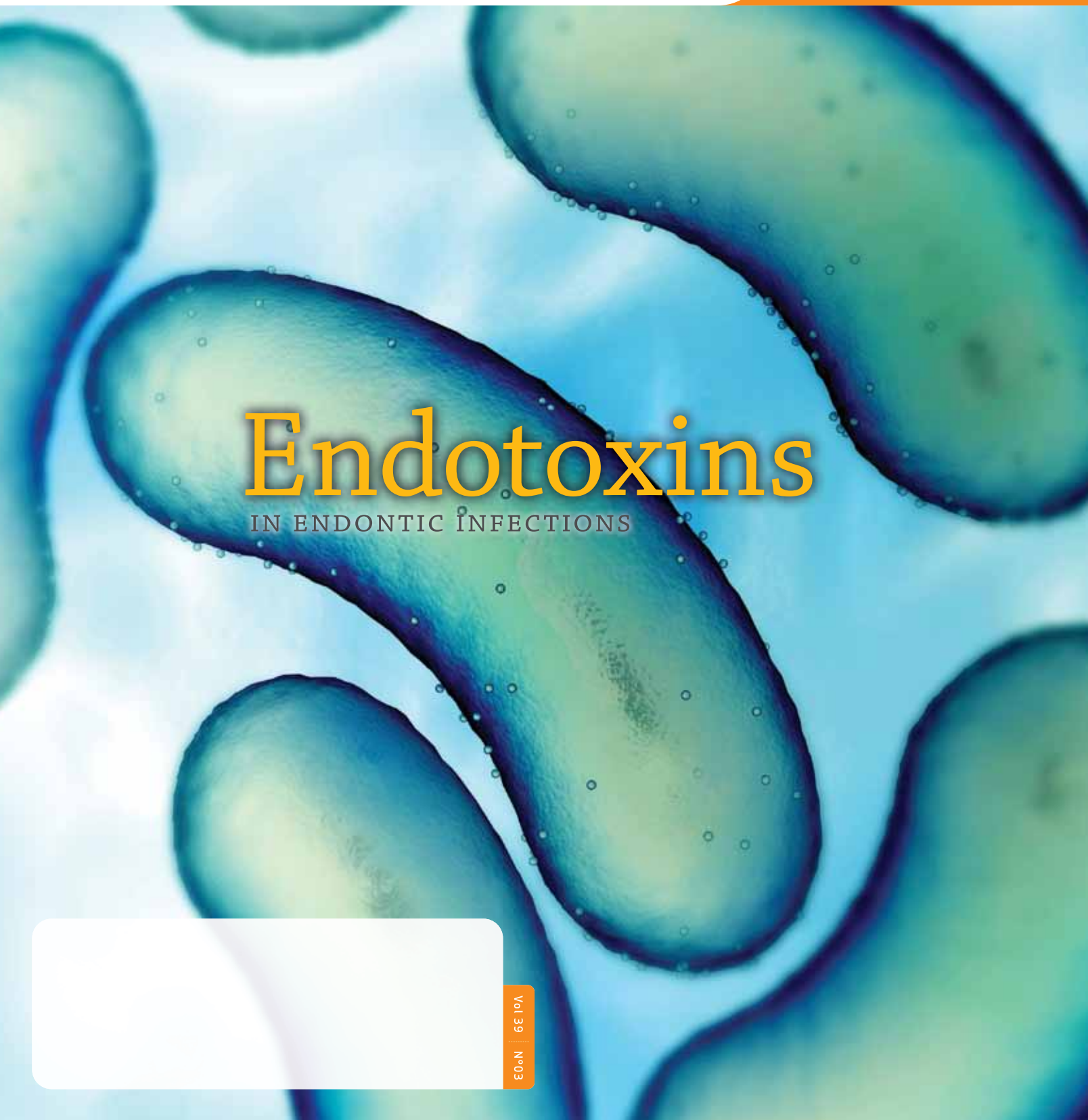
Journal

MARCH 2011

Perio Interceptive Surgery

Dentinal Hypersensitivity

Acne Calcification



Endotoxins

IN ENDONTIC INFECTIONS

Vol 39 No 03

Protecting dentists.

It's all we do.[SM]

- Professional Liability
- Office Property
- Employment Practices Liability
- Workers' Compensation
- Life/Health/Disability
- Long-Term Care
- Business Overhead Expense
- Home & Auto

800.733.0633 tdicsolutions.com CA Insurance Lic. #0652783

Coverage specifically underwritten by The Dentists Insurance Company includes Professional Liability, Office Property and Employment Practices Liability. Workers' Compensation, Life, Health, Disability, Long-Term Care, Business Overhead Expense, Home and Auto products are underwritten by other insurance carriers, brokered through TDIC Insurance Solutions.

tdic®

CDA JOURNAL, VOL 39, Nº3

DEPARTMENTS

137

FEATURES

OF THE CALIFORNIA DENTAL ASSOCIATION

Journal

CDA Journal
Volume 39, Number 3
MARCH 2011

cda

Journal of the California Dental Association

published by the California Dental Association
1201 K St., 14th Floor
Sacramento, CA 95814
800.232.7645
cda.org

Reader Guide:

Upcoming Topics
APRIL: *Recession Erosion*
MAY: *Somnology*
JUNE: *Aggressive Periodontitis*

Manuscript Submissions
Patty Reyes, CDE
ASSISTANT EDITOR
Patty.Reyes@cda.org
916-554-5333
Author guidelines are available at cda.org/publications/journal_of_the_california_dental_association/submit_a_manuscript

Classified Advertising
Jenaé Gruchow
COMMUNICATIONS ASSISTANT
Jenae.Gruchow@cda.org
916-554-5332

Display Advertising
Corey Gerhard
ADVERTISING MANAGER
Corey.Gerhard@cda.org
916-554-5304

Letters to the Editor
Kerry K. Carney, DDS
Kerry.Carney@cda.org

Subscriptions
The subscription rate is $18 for all active members of the association. The subscription rate for others is as follows:
Non-CDA members and institutional: $40
Non-ADA member dentists: $75
Foreign: $80
Single copies: $10
Subscriptions may commence at any time. Please contact:
Jenaé Gruchow
COMMUNICATIONS ASSISTANT
Jenae.Gruchow@cda.org
916-554-5332

Permission and Reprints
Jeanne Marie Tokunaga
PUBLICATIONS MANAGER
JeanneMarie.Tokunaga@cda.org
916-554-5330

Journal of the California Dental Association (ISSN 1043-2256) is published monthly by the California Dental Association, 1201 K St., 16th Floor, Sacramento, CA 95814, 916-554-5330. Periodicals postage paid at Sacramento, Calif. Postmaster: Send address changes to *Journal of the California Dental Association*, P.O. Box 13749, Sacramento, CA 95853.

CDA JOURNAL, VOL 39, Nº3

In the Blink of an Eye

KERRY K. CARNEY, DDS

At 6:11 p.m. on a Thursday evening, my dear aunt (who turned 80 last June) would normally be watching *Larry King Live* in her living room. She would be 3 feet from the glass windows that face the street. She would be overlooking the trees in the park on the other side of Glenview Drive in San Bruno, Calif.

On this particular Thursday, Sept. 9, 2010, she was downstairs in the most protected part of the home she had lived in for more than 40 years. She was busy working at her computer on one of her volunteer duties for Mission Hospice.

When the 30-inch gas pipe ruptured and exploded at the corner of Glenview Drive and Earl Avenue, it was 20 feet from her sidewalk. When great chunks of asphalt (which my aunt insists on calling "the macadam") from the destroyed pavement on Glenview Drive came raining down on her house, they had to pass through the roof, her bedroom, and the ceiling of her basement/laundry room before falling fortuitously in locations other than where she was sitting. Looking up from her secretary's chair in the basement, she could see open sky.

She knew right away it was not an earthquake and she didn't think it was a plane crash, though San Bruno is in the flight path for San Francisco International Airport. She thought that terrorists had blown up the airport. She walked up the seven stairs to the kitchen and looked around the corner into the living room. Through the shattered glass windows, she could see that the trees in the park across the street were ablaze. She had the presence of mind to get her phone, her purse and a bottle of water. She turned, walked back down the stairs, and out the back door of the basement.

Though we in California see our share of disasters, they are not uncommon in the other 49 states.

The backyard gate had been blown open. This was lucky because by that time, the extreme heat would have made the metal handle too hot to touch. As she exited, she could see the house across the street already was melting. She said the stucco was slumping off like cake frosting. She turned to her left and walked up Earl Avenue toward the fire station. The 800-foot flame fed by the gas venting from the ruptured pipe had created its own weather and was sucking the air down to the combustion point creating a gale force wind that she had to struggle against to walk.

A neighbor saw her, put her in his car, and drove her up to the fire station. She got out of her home with her most precious possession: her life. Everything else was gone.

In the months that have followed, she has spent every day trying to restore her life to a normal, safe, and comfortable existence. It is a full-time job, an emotional roller coaster, and a personal tragedy. A disaster as unusual as a catastrophic gas pipe failure is difficult to anticipate but disaster preparedness is something for which we all must plan.

California has the distinction of having opportunities almost annually to practice and refine our disaster preparedness.[1] This is, after all, earthquake country (oh yes: mudslide and wildfire country as well). Though we in California see our share of disasters, they are not uncommon in the other 49 states.

On Aug. 16, 2010, the Virginia Dental Association headquarters was struck by lightning and destroyed in the fire that followed. No one was hurt, but the VDA had to relocate and rebound from the setback. Across the nation, dental association leaders were asking, "What if that happened here?"

For California, the answer is clear: CDA would enact its comprehensive Business Continuity Plan (BCP). It would continue to serve its members and policyholders.

In 2005, between the 9/11 terrorist attacks and Hurricane Katrina, CDA began to develop its BCP. It also began a companywide Disaster Recovery (DR) planning process, which consists of defining the policies and procedures, related to preparing for recovery or continuation of business after a technology infrastructure interruption following a disaster. Because of the complexity of the organization, a comprehensive plan took years to develop. In March 2010, CDA's BCP was introduced.

The planning process included an assessment of risks and the establishment of business requirements as a basis for a technical solution. It was determined that CDA's needs were best met by having a small temporary off-site location to be used in an emergency. A secure Business Resumption Center (BRC) has been outfitted with servers, workstations, and phones.

If a disaster affects CDA's physical or computer infrastructure, the BRC will be activated. E-mail will function almost immediately and toll-free phone lines will

be available at the BRC within 24 hours. Replicated and backed-up computer files will be used by IT to recreate a limited-function working environment at the BRC to allow continued business. Full functionality (within BRC limits) will be established sometime after 24 hours, depending on the scope and nature of the disaster. Management laptops will be configured to interact with the BRC environment. In a regional disaster similar in size and scope to Hurricane Katrina, the priority would be the safety and well-being of staff and members, rather than resumption of CDA functions.

Last year the BCP was tested. During the simulated emergency, management staff had a chance to address the following questions: Who should be contacted, when, and how? What resources would realistically be available? What information would they need for their decision-making? How would they acquire that information? At what point would the BRC need to be activated?

The test enabled the team to become familiar with the communication and decision-making challenges of a simulated disaster situation. However, disasters and catastrophic cascades do not follow an existing playbook. Events have a way of exploiting gaps in our plans. The tests are an opportunity to refine the planning for disaster preparedness.

Dwight D. Eisenhower is credited with having said, "It's all in the planning. The plan is useless: It's the planning that's important." Through battlefield experience, he knew that soldiers in the field meet unanticipated, complicating circumstances. Through a planning process, a chain of command can be set and a list of resources to help address unforeseen problems can be made available. It is through planning, testing, and planning again that an organization develops the agility and resilience to meet and overcome unanticipated problems. The BCP/DR must be continually updated and kept current as CDA evolves.

CDA's BCP/DR is not the part of CDA that we, as members, think about at all. It is more like disability insurance: You hope you will never need to rely on it. However, it is exactly this kind of planning that is the hallmark of what we have come to expect of CDA: foresight, flexibility, and preparedness. When in place and executed properly, one may never be aware of it. CDA will strive to deliver the services and communication we expect even in the aftermath of catastrophic interruption.

Living life in terror of manmade or natural disasters cripples one's ability to enjoy and participate in life. Being prepared for catastrophic detours from the quotidian path allows one to be fully present in the here and now. It is important to keep this in mind. If you ask my aunt, she will tell you: everything can change, in the blink of an eye. ■■■■

REFERENCE

1. Shue B, Prepare your office for the big one. *J Calif Dent Assoc* 38(11):781-2, November 2010.

ADDITIONAL RESOURCES

Tokunaga JM, California Dental Association's Business Continuity Plan, 2010

The Journal of the California Dental Association *welcomes letters from readers on articles that have appeared in the* Journal. *We reserve the right to edit all communications and require that all letters be signed. 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 may be submitted via e-mail to the* Journal *editor-in-chief at kerry.carney@cda.org. By sending the letter to the* Journal, *authors acknowledge and agree that the letter and all rights of the letter's author become the property of the California Dental Association.*

"I consider the decision to attend this **sedation course** among the most important of my career. Here, at last, was a system I could successfully **apply to my whole practice."**

– Larry Daugherty, DMD *Sylvester, Georgia*

Oral Sedation Dentistry | Pediatric Sedation Dentistry

San Francisco, CA | June 9-11, 2011

Seattle, WA | October 20-22, 2011

Visit us at CDA Presents:The Art and Science of Dentisty | **Booth #463**

(866) 592-9617 | DOCSeducation.org

Academy of General Dentistry PACE

Approved PACE Program Provider FAGD/MAGD Credit 1/1/2009 to 12/31/2012

Follow us on:

FACEBOOK
facebook.com/DOCSeducation

TWITTER
twitter.com/DOCSeducation

D·O·C·S EDUCATION
MEMBERSHIP · EQUIPMENT

AD-4045

Controversy Controversial

It is disturbing that the editor of the *Journal of the California Dental* Association proffers an obscure science-fiction writer's opinion as if it were a law of nature like the Law of Gravity, then uses that law to discredit all with passion as ignorant. Sound silly? According to Benford's Law of Controversy, "passion is inversely proportional to the amount of true/real information available." Dictionary.com defines ignorance as "lack of knowledge, information, or education." It follows that those with the most passion are the most ignorant. Benford's Law of Controversy is no more a law than Murphy's Law of Rush-Hour Traffic, which states that during rush hour whatever lane you are driving in will be the slowest.

The board of directors of the San Fernando Valley Dental Society is passionate about the oral health of the people of the state of California. The more the SFVDS Board learned about several concepts offered to care for those patients not currently served, the more passionate the SFVDS board has become in protecting those most vulnerable patients. Currently, California has more types of license levels for dental providers than any other state. Hygienists can practice in alternative settings, assistants can place and finish restorations, as well as cement permanent crowns. Studies are under way to determine the safety and quality of diagnosis by off-site dentists to aid in urgent treatment decisions thus helping to overcome the geographical barrier to care.

Every time there is an expansion of duties, addition of places of practice, or change in level of supervision proposed, one of the reasons put forth is that the change will improve access to care and reduce the disparity in oral health levels of the underserved. Yet, year after year, the access-to-care problem worsens and the disparity in oral health continues. Even in New Zealand, where dental therapists have existed for more than 50 years, oral health has decreased after 40 years of improvement, according to one study in 2006 by the New Zealand Ministry of Health, "Good Oral Health, for All, for Life — the Strategic Vision for Oral Health in New Zealand. Clearly, additional provider types and expansion of duties do not provide the solution to caring for the underserved. For those who have caries and other oral health problems, all the research leads to the conclusion that the single, largest barrier to care is not the lack of a new provider.

Despite the push toward expanding the dental workforce model to include midlevel-type providers, oral health literacy and water fluoridation continue to be the most cost-effective methods to reduce caries. In New Zealand, as Dr. Jay Friedman points out in his article in the *Journal of the California Dental Association* (39(1)22:9, January 2011), fluoridation was the cause for the great reduction in the number of dental therapists from 1970 to today. That reduction can only come as a result in the reduction of need for the dental therapists. The benefits of community water fluoridation require no additional effort by any patient and are available across all racial, socioeconomic, cultural, and geographic boundaries. Improving oral health literacy can be accomplished using dental team members within the duties currently allowed by law.

The effort CDA is making to educate its members about access to care is almost exclusively about the MLP and the tone is so condescending that all this education seems more like indoctrination and groundwork for a predetermined outcome from the Access-to-Care Workgroup. We at the SFVDS have been repeatedly told by various members of the CDA Executive Committee to withhold making any judgments until the Access-to-Care Workgroup has made their report, yet CDA has no such restrictions and continues to use its full resources to sway opinion in favor of such alternative workforce models.

Only with an impartial and balanced account can CDA membership make educated decisions in this complex arena. To date, CDA members are not receiving such respectful balance of opinion. The SFVDS asks for inclusion of the many alternatives to the midlevel provider and access to care issues rather than the one-sided view we have been subjected to thus far.

SINCERELY,
MEHRAN ABBASSIAN, DDS, PRESIDENT
Board of Directors of the
San Fernando Valley Dental Society

Reader Appreciates Debate Over Dental Workforce

I want to applaud you for the *January issue of the Journal of the California Dental Association* (39(1)1-60, 2011). I know it took no small amount of courage to confront the challenges we face as a profession by publishing articles that represent viewpoints that are anathema to many dentists. I agree with the assertions in your editorial and commend its measured and professional tone. Only knowledge and

CONTINUES ON 134

Implant Direct
simply smarter.
Sybron Dental Specialties

www.implantdirect.com
Implant Direct Sybron International
1-818-444-3333 • 1-888-NIZNICK

AOA · Axis · Kerr · TotalCare · Attachments International · Implant Direct Sybron Int'l · Metrex · SybronEndo · Ormco · Orascoptic

a DANAHER company

Why Buy Abutments?

With Implant Direct's All-in-One implant packaging, you receive a fixture-mount that functions as both transfer and abutment.

Restorative dentists, when working in the team approach, request Implant Direct implants for your patients to reduce or eliminate the cost of prosthetic components.

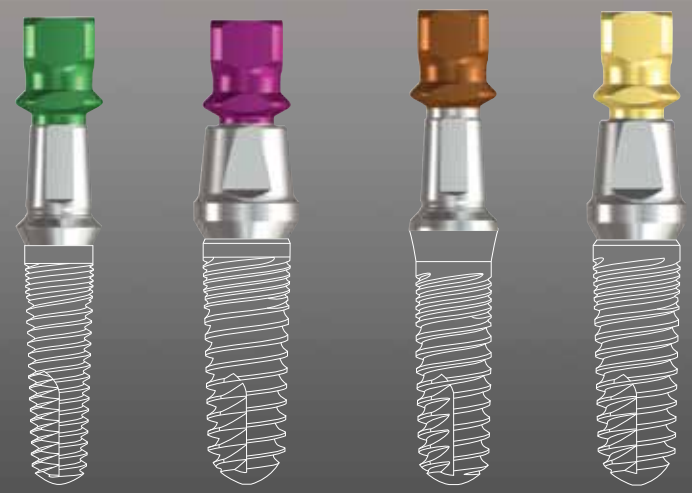
Industry Compatible Abutments

A complete line of prosthetic components for NobelBiocare Tri-Lobe, Straumann Internal Octagon and Zimmer/BioHorizons/MIS Internal Hex implants.

†Price excludes Prosthetic Coping and Attachments.
**Price includes Transfer, Abutment housing kit and Comfort cap.

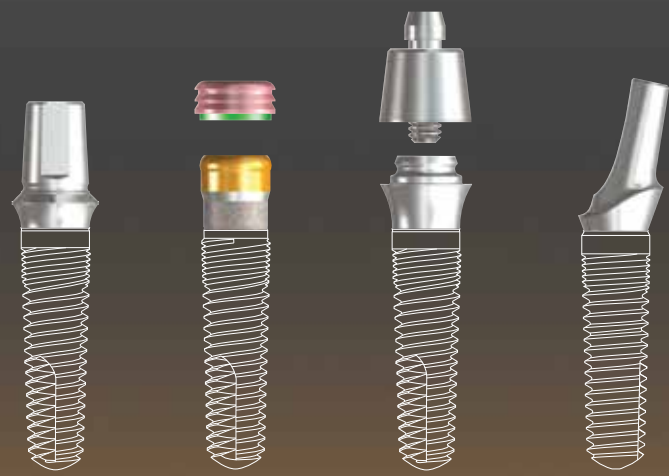
Two-Piece Implants

Includes fixture-mount/transfer that can be shortened for use as a final straight abutment



ScrewPlant® Internal Hex | Legacy™ Internal Hex | SwishPlant™ Internal Octagon | ReActive® Internal Tri-Lobe

One-Piece Implants



ScrewDirect® Straight Snap-on | GoDirect™* Attachment | ScrewIndirect® Screw-Receiving | ScrewRedirect® Angled Contoured

Implant Direct Sybron International 8840 W. Russell Road #210, Las Vegas, NV 89148
Manufacturing/Sales: 1-818-444-3333
www.implantdirect.com

*Compatible with Zest LOCATOR® System
LOCATOR® is a registered trademark of Zest Anchors Company. The GoDirect™ and GPS™ Systems are neither authorized, endorsed nor sponsored by Zest Anchors Company
All trademarks are the property of their respective companies

LETTERS, CONTINUED FROM 132

discussion will eliminate the controversy

The fallacy of the use of dental therapists to address the unmet dental needs of native Alaskans is best illustrated by the statistics cited by Dr. Nagel himself (page 31), "The American Indian/Alaska native (AI/AN) population has the highest rate of dental caries of any population cohort in the United States, five times the U.S. average for children 2 to 4 years of age. Seventy-nine percent of AI/AN children, age 2-5, have tooth decay, with 60 percent of these children having severe early childhood caries. Eighty-seven percent of these children, age 6-14, have a history of decay, twice the rate of dental caries experience for the general population. Ninety-one percent of AI/adolescents, age 15-19, have caries. Sixty-eight percent of AI/AN children have untreated dental caries. One-third of schoolchildren report missing school because of dental pain and 25 percent report avoiding laughing or smiling because of the appearance of their teeth."

If the disease we were considering was tuberculosis, no one would be suggesting we train an army of physician assistants in Alaska (or New Zealand) to perform repeated pulmonary surgeries. The surgical approach would be dismissed as insanity in favor of a medical approach that identified and then eliminated the underlying factors that allowed such an epidemic to occur in the first place.

Despite Dr. Nagel's claim of "the implementation of significant public health programs of decay prevention by the Indian Health Service (IHS) and tribe," any dental health professional understands these interventions, while well-intended, have been inadequate for the circumstances. We know no child is born with caries and we further know this epidemic is entirely preventable. While the damaged dentitions currently existing will all require a lifetime of professional care, the implementation of interceptive programs that either reduce the cariogenic pathogens or otherwise modify the dietary and learned behaviors that lead to the high incidence of caries are the only hopes of significantly reducing the suffering and would further obviate the need for massive dental manpower.

When do we, as a profession, stop blaming the patients or citing their geographical circumstances and start implementing the practices we know will solve the problem?

STEPHEN O. GLENN, DDS
Tulsa, Okla.

Editor's note: *The January issue of the* Journal *provided the history and context for the RDH alternative practice in California, the dental therapist internationally, and the dental health aide therapists in Alaska. In the February issue, the* Journal *brought you a letter from an administrator of the dental therapist program in New Zealand, a review of effective ways of addressing barriers to care across the nation, and an article by one author on his belief that the therapist model is neither appropriate nor effective for the United States. February also included an overview of what the CDA Foundation has done to address the issue of barriers to care in California.*

In order to make decisions, it is important to determine the problem and thoroughly understand the external landscape. The Journal *will continue to present a spectrum of information on issues of concern to dentistry.*

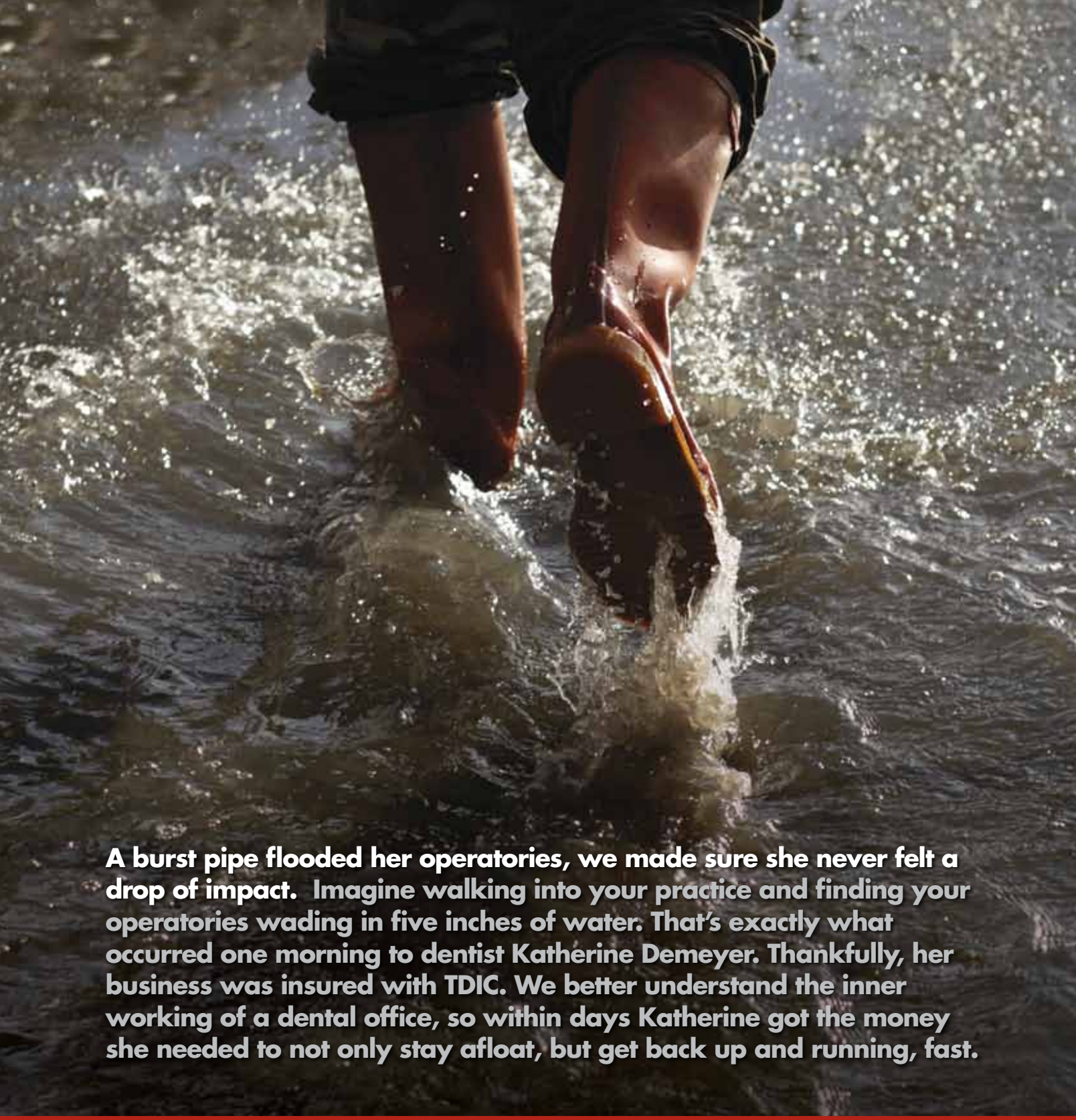
Advocacy
Protection
Education
Support
Community

Gyan Parmer, DDS
Member since 2002

Progress. It's what happens when 25,000 dentists work together.

cda.org/renew

cda®



A burst pipe flooded her operatories, we made sure she never felt a drop of impact. Imagine walking into your practice and finding your operatories wading in five inches of water. That's exactly what occurred one morning to dentist Katherine Demeyer. Thankfully, her business was insured with TDIC. We better understand the inner working of a dental office, so within days Katherine got the money she needed to not only stay afloat, but get back up and running, fast.

Protecting dentists.
It's all we do.℠

800.733.0633
tdicsolutions.com
CA Lic. #0652783

tdic®

CDA JOURNAL, VOL 39, Nº3

Photo: Michael Spengler

Mona Lisa, a 10-pound Chihuahua/Dachshund mix, has become a welcome addition for the staff and patients at the La Jolla practice of Dr. Tracy A. Taddey and her father, Dr. John Taddey. →

Pooch in the Practice: Mona Lisa Makes Patients Smile

BY PATTY REYES, CDE

While it remains an age-old mystery behind the smile of Da Vinci's *Mona Lisa*, it is far less ambiguous for the patients of a father-daughter dental team when it comes to their dental therapy pooch, Mona Lisa.

When Tracy A. Taddey, DDS, recently joined her father's practice in La Jolla, Calif., a picturesque seaside community in San Diego, she brought along Mona Lisa, a rescued 18-month-old Chihuahua/Dachshund mix, as a way to soothe any nervousness or tension a patient may have about their dental procedure.

The 10-pound wonder with short, butterscotch-colored fur and welcoming green eyes has a wide fan base.

"I can honestly say that Mona has been enthusiastically embraced by all of our patients," said Taddey, a third-generation

CONTINUES ON 138

RDAs Needed for Medical Mission to Central America

International Medical Alliance, a nonprofit group based in Southern California, is looking for two registered dental assistants to volunteer for an upcoming medical mission to Esteli, Nicaragua, Aug. 4-14.

More than 60 dentists, nurses, doctors and support personnel already have volunteered for the trip to Nicaragua's third-largest city located on the Pan-American Highway, north of Managua.

"We have a very diverse group of volunteers joining us for our medical mission, including general, plastic, and maxillofacial surgeons," said Ines Allen, International Medical Alliance's founder and president. "However, we are still looking for two registered dental assistants to complete our team."

Room and board will be provided by the Nicaraguan government; volunteers are expected to pay for their own airfare.

International Medical Alliance recruits health care workers from all medical fields to volunteer and help children and those with limited economic means. For more information about the mission or International Medical Alliance's efforts in the United States and abroad, contact Ines Allen at 760-485-8963 or go to internationalmedicalalliance.org.

CDA JOURNAL, VOL 39, Nº3

Correction

Due to a technological error, several lines of one paragraph were missing from Page 99 of the February 2011 issue of the *Journal*. A corrected version of the issue has been posted on CDA's website at cda.org/publications. Following are the restored sentences from the article "Improving Oral Health Care and Oral Health Care Delivery for Children," by James J. Crall, DDS, ScD:

In conclusion, national- and state-level evidence have clearly documented the existence and consequences of ongoing disparities in children's health and utilization of oral health care services. Notable progress in addressing these disparities has been made in states that have combined strong leadership in both public and private sectors, broad-based support, and a strategic framework geared toward two major goals: reducing the burden of dental disease over time and ensuring access to and utilization of appropriate diagnostic, preventive, treatment and disease management services (with priority given to programs focusing on children and high-risk families). The complex nature of the determinants of oral health and utilization of oral health services underscore the need for collaborative multifaceted approaches to achieve these goals, including involvement of "nontraditional oral health stakeholders." Prominent contextual and overarching considerations and an increasingly diverse population underscore the need for approaches that are innovative, solidly evidence-based, targeted, and coordinated in order to maximize effectiveness and efficiency.

CDT 2011-2012: The ADA Practical Guide to Procedure Codes

The American Dental Association is offering a resource, *CDT 2011-2012: The ADA Practical Guide to Dental Procedure Codes*, to accurately and report dental services delivered to patients.

The book contains the updated edition of the "Code on Dental Procedures and Nomenclature," along with a number of expanded reference sections such as questions and answers concerning the selection of the appropriate procedure codes for patient records and for claim submissions. New information and forms for caries risk assessment and documentation also are included.

Additionally, the ADA also is offering a revised CDT companion: *The ADA Practical Guide to Dental Coding* that provides more information on areas ranging from dental/medical cross-coding to how to submit dental claims to a patient's medical insurance carrier. This version includes an expanded set of clinical coding scenarios that cover a wide variety of patient services and can be a great resource for instructing dental staff on difficult coding scenarios.

The *CDT 2011-2012: The ADA Practical Guide to Dental Procedure Codes* that includes a searchable CD-ROM, and the *CDT Companion: The ADA Practical Guide to Dental Coding* are available as a set for $84.95 for ADA members and $127.45 for nonmembers. The *CDT 2010-2012* and its CD-ROM are $49.95 for ADA members; $74.95 for nonmembers. The *CDT Companion* is for $49.95 for ADA members and $74.95 for nonmembers. For more information, go to adacatalog.org or call 800-947-4746.

MONA LISA, CONTINUED FROM 137

dentist. "I brought her to work immediately after adopting her from the shelter. The first time she provided her special "pet therapy" was when a nervous patient, who immediately adored Mona, asked if she could be on her lap during her procedure. Mona is a very mellow and nurturing little animal; it is her nature to be held and fall asleep in your arms. She is quiet, obedient, and adores everyone. Knowing this, I introduced her to sitting on this patient's lap while I performed my dental work. Mona immediately curled up on the patients lap and took a nap, and the patient cuddled and petted Mona to ease her own nerves and distract her from the dental work I was busy doing. Mona's mere presence changed the whole experience for the patient — from the injection to the drill. Mona does not even perk her ears up when the high-pitched hand piece starts up; she seems to know that is the beginning of the procedure and the end is when I take my gloves off, remove my mask, and tell the patient how great they did. Amazing for a little Chihuahua."

Taddey said the staff enjoys taking turns walking the dog and love being greeted by Mona Lisa every morning. Reaction from staff and patients regarding Mona Lisa has been very positive and downright fun. "In general, the consensus seems to be that most of the population does not like going to the dentist. Mona's presence in our office has changed that negative aura with anxious patients as well as with patients who just love dogs or who have pets. She seems to appeal to everyone's humanistic side, whether she is present in the clinical setting or just says hello as patients check in or out."

Taddey added that she and her father, a New York University Dental School graduate, "find it refreshing and so rewarding that a little rescue dog can provide so much ease and a positive experience to going to the dentist."

It's a good thing Mona Lisa has her own business card, which provides lots of

CONTINUES ON 139

Lower Income, Minority, Special Needs Children More Likely to Suffer Toothaches

Toothaches, according to a recent study, are more likely to afflict poor, minority, and special needs children.

"Toothache is a source of chronic and often severe pain that interferes with a child's ability to play, eat, and pay attention in school," said authors in a report published in an issue of *Archives of Pediatrics and Adolescent Medicine*. "The most common cause of toothache is dental decay" and the "process of dental decay is one that optimally would be prevented or, at the very least, identified early and then arrested through provision of regular professional dental care. However, for some U.S. children, including those who are Medicaid-insured, access to preventive and restorative dental care is more difficult."

Studying data from the 2007 National Survey of Children's Health, Charlotte Lewis, MD, MPH, and James Stout, MD, MPH, both of the University of Washington School of Medicine, Seattle, tried to determine the risk factors and frequency for toothache in children. A population-based sample of parents/guardians of 86,730 children between ages 1 and 17, from every state and the District of Columbia was the source of the data. Authors found that an estimated 10.7 percent of U.S. children had a toothache in the previous six months. A toothache was the most reported affliction for youngsters between the ages of 6 and 12; one in seven reported toothaches in the past six months.

Additionally, findings revealed that 58 percent of children who had a toothache also had cavities within the past six months.

The original article, "Toothache in U.S. Children," by Lewis C, Stout J, appeared in *Arch Pediatr Adolesc Med*, 164(11):1059-63, November 2010. Additional information provided by *ScienceDaily,* sciencedaily.com/releases/2010/11/101101161831.htm. (Accessed Jan. 13, 2011.)

MONA LISA, CONTINUED FROM 138

levity as patients register, leave the office, or make their next appointment. Patients can call and specifically ask if Mona will be available for their appointment, Taddey said. "One of our patients made (Mona Lisa) a handmade quilt, which accompanies us everywhere, and she sits on this on the patient's lap when she is requested for their procedure."

Taddey practices with her father, John Taddey, DDS, just as he practiced with his father, also named Dr. John Taddey, in the Bronx. Dr. Tracy Taddey's father also taught postgraduate dentistry at Montefiore Hospital in the Bronx before putting down roots in La Jolla in 1974 at a location where he still works today. Prior to joining her father's practice, Dr. Tracy Taddey, a 1998 graduate from what is now known as the Arthur A. Dugoni School of Dentistry in San Francisco, opened her own in Clairemont Mesa in 2001, where she currently also works part time.

"Practicing together as father-daughter, and as a third-generation dentist, is a true blessing and is an amazing experience we are both grateful for every day," said Dr. Tracy Taddey. "My dad has always been my inspiration, my mentor, and my best friend. He has taught me more than I ever could have learned in dental school, and as we combine our generations, we learn from each other all the time. My dad is very open-minded and progressive. He is very excited to have the addition of "pet therapy" to his 37-year-old La Jolla practice. I am honored to follow in his path and provide new dimensions to the strong foundation he has spent his life building.

"Having Mona on board only provides another level of happiness, uniqueness, and caring that we can offer to our patients. We agree that it is very gratifying as doctors to know that not only do we provide excellent dental treatment to our patients, but they are having a soothing and happy experience while we take care of their long-term dental health. Our relationships with our patients are our first priority and Mona only adds to this bond and the evolution of the practice."

"Not only do we provide excellent dental treatment to our patients, but they are having a soothing and happy experience while we take care of their long-term dental health."

TRACY A. TADDEY, DDS

"A dietary therapy, if effective, might be a less expensive and safer method for the prevention and treatment of periodontitis."

ASGHAR Z. NAQVI, MPH, MNS

Particular Diet May Be Beneficial to Those With Periodontitis

Periodontitis, if left unchecked, may lead to the accumulation of bacteria, and potential bone and tooth loss. And while traditional treatments focus on bacterial infection, newer approaches target the inflammatory response. But there may be another tack: diet.

In a recent issue of the *Journal of the American Dietetic Association*, Harvard Medical School and Harvard School of Public Health researchers found that dietary intake of polyunsaturated fatty acids (PUFAs) such as fish oil, is known to have anti-inflammatory properties and shows potential for treating and preventing periodontitis. Other foods that contain significant amounts of polyunsaturated fats include fatty fish such as salmon; nuts, margarine, and peanut butter.

"We found that n-3 fatty acid intake, particularly docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), are inversely associated with periodontitis in the U.S. population," said Asghar Z. Naqvi, MPH, MNS, Department of Medicine, Beth Israel Deaconess Medical Center. "To date, the treatment of periodontitis has primarily involved mechanical cleaning and local antibiotic application. Thus, a dietary therapy, if effective, might be a less expensive and safer method for the prevention and treatment of periodontitis. Given the evidence indicating a role for n-3 fatty acids in other chronic inflammatory conditions, it is possible that treating periodontitis with n-3 fatty acids could have the added benefit of preventing other chronic diseases associated with inflammation, including stroke as well."

Data from the National Health and Nutrition Examination Survey (NHANES) was used. Investigators found that dietary intake of the PUFAs, DHA, and EPA were associated with a decreased prevalence of periodontitis, although linolenic acid (LNA) did not show this association, according to a news release by *ScienceDaily*.

UPCOMING MEETINGS

2011

April 7–10	California Society of Pediatric Dentistry 36th annual Session/Western Society of Pediatric Dentistry ninth annual session, San Francisco, 831-625-2773, drrstewart@aol.com.
April 10–16	United States Dental Tennis Association, Tampa, Fla., dentaltennis.org.
May 12–14	*CDA Presents* the Art and Science of Dentistry, Anaheim, 800-CDA-SMILE (232-7645), cdapresents.com.
June 16–18	ADA New Dentist Conference, Chicago, 800-621-8099, ext. 2779, ada.org/goto/newdent.
Sept. 22–24	*CDA Presents* the Art and Science of Dentistry, San Francisco, 800-CDA-SMILE (232-7645), cdapresents.com.
Nov. 6–12	United States Dental Tennis Association, Palm Desert, Calif., dentaltennis.org.

To have an event included on this list of nonprofit association continuing education meetings, please send the information to Upcoming Meetings, CDA Journal, 1201 K St., 16th Floor, Sacramento, CA 95814 or fax the information to 916-554-5962.

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

TECHNOLOGY

JIN-HO PHARK, DDS, DR.MED.DENT

Resin Infiltration Helps Control Caries

Ekstrand KR, Bakhshandeh A, Martignon S, Treatment of proximal superficial caries lesions on primary molar teeth with resin infiltration and fluoride varnish versus fluoride varnish only: efficacy after one year. *Caries Res* 44(1):41-6, 2010.

AIM: The purpose of this study was to assess the efficacy of resin infiltration and fluoride varnish (FV) application combined versus FV treatment-only of interproximal carious lesions on deciduous molars.

METHODS: Forty-eight children with one or more pairs of interproximal caries lesions on deciduous molars with no or initial clinical signs of caries and radiological extension of the lesion up to the outer third of the dentin were selected. One lesion of each pair was randomly allocated to the test treatment (resin infiltration) followed by 2.26 percent FV), the other lesion was allocated to the control treatment (2.26 percent FV only). ICDAS scores of the selected lesions were recorded before the treatments. FV was applied to both, the test and the control lesions six and 12 months after the first treatment. After one year, ICDAS scores were obtained for 42 children and radiographs for 39. One external examiner scored the radiographs twice for progression of caries.

RESULTS: Baseline mean age of the children was 7.17± 0.68 years and mean def-s was 8.1±6.9. After one year, the ICDAS scores of 31 percent of the test lesions and 67 percent of the control lesions had progressed ($p < 0.01$). Radiographically, 23 percent of the test lesions and 62 percent of the control lesions had progressed ($p < 0.01$). Thus, the clinical and radiographic therapeutic effect of both resin infiltration/FV over FV alone was >35 percent and significant.

CONCLUSIONS: Resin infiltration in conjunction with fluoride varnish seems promising for controlling proximal lesion progression on deciduous molar teeth.

CLINICAL RELEVANCE: Resin infiltration is an innovative concept to arrest progression of caries lesions noninvasively. Resin infiltration of interproximal caries lesions on deciduous molars is efficacious. Application of this treatment can prevent or delay invasive treatment in deciduous teeth.

IMPLANTS

RICHARD T. KAO, DDS, PHD, AND DAVID W. RICHARD, DDS, PHD

The Two-Implant Overdenture Can Function for a Long Period

Vercruyssen M, Marcelis K, et al, Long-term, retrospective evaluation (implant and patient-centered outcomes) of the two-implant-supported overdenture in the mandible. Part I: survival rate. *Clin Oral Impl Res* 21(4):357-65, April 1, 2010.

AIM: This study reports the long-term survival rate of implants used in paired situations to support mandibular overdentures at the Catholic University, Leuven, Belgium.

METHODS: Retrospective analysis of 495 cases where two implants were used to support mandibular overdentures was performed. This represented cases treated over the past 25 years at this academic center. Of the 495 cases, 75 percent were available for clinical evaluation or chart review. The rest represented patients who could not be contacted or had died.

RESULTS: Most implants were machined (95 percent) while the rest were anodized (TiUnite) Branemark type implants. The paired implants were used either as a bar (86.3 percent), ball attachments (11.7 percent), or magnets (1.6 percent) anchorage. The survival rate after 20 years of loading was 95.5 percent. Factors associated with implant failure included smoking and one-stage-placed implants. Implant length and bone quality had no impact on implant survival.

CONCLUSIONS: This study supports the two-implant overdenture concept in the mandible as a treatment approach that can function for a long period of time.

CLINICAL RELEVANCE: Given the difficulty in obtaining mandibular denture stability, the use of two implants to provide anchorage will improve function and quality of life. This study provides clinicians with evidence that implants used in this approach can function for a long period of time. Furthermore, these results were obtained using predominantly the older-styled machine surface implants. The newer implant surfaces may potentially provide better results.

CDA JOURNAL, VOL 39, Nº3

SURGERY

D.D.R. YAMASHITA, DDS

Blast Explosion-Induced Injury, Basic Principles of Wound Physiology and Treatment, and Airway Management

Shuker S, Facial skin-mucosal biodynamic blast injuries and management. *J Oral Maxillofac Surg* 68(8):1818-25, August 2010.

AIM: To evaluate both the nature of potential injuries to facial soft tissue associated with blast explosions and the management of such injuries. In addition, the biophysics of blast injuries is discussed.

METHODS: This is a review article that initially examines the science of blast physics, which then leads to the in-depth exploration of biodynamic sequelae of blast trauma, specifically thermal injuries and injuries related to the scalp, facial skin, eyelid, lip, and primary and secondary blast effects. The emergent management of blast-associated airway compromise is also explored.

RESULTS: The incidence of blast morbidity and mortality has dramatically increased in recent years, particularly with the escalating use of improvised explosive devices (IEDs) in global conflict. Understanding the nature of associated facial soft-tissue injuries and airway compromise, along with management, can enhance the scope and quality of care of the maxillofacial surgeon.

CONCLUSIONS: International interest in blast biophysics, injury, and injury management has been renewed with the evolution of weaponry, particularly IEDs. Quality management of the associated facial injuries and airway compromise demands vigilance, knowledge, and experience.

CLINICAL RELEVANCE: Although blast explosion-induced injury is a highly specific aspect of maxillofacial trauma, basic principles of wound physiology and treatment, and airway management, underlie quality care of any traumatic injury. Appreciation of blast injuries is particularly beneficial for maxillofacial surgeons, in training or in practice, at major trauma centers.

PERIODONTICS

GERALD I. DRURY, DDS

One-Stage Full-Mouth Disinfection Versus Full-Mouth Scaling and Root Planing and Quadrant SRP

Swierkot K, Nonnenmacher CL, et al, One-stage, full-mouth disinfection versus quadrant and full-mouth root planning. *J Clin Periodontol* 36(3):240-9, March 2009.

BACKGROUND: The purpose of this study was to test whether one-stage full-mouth disinfection (FMD) results in greater clinical and microbiological improvement compared with full-mouth scaling and root planing (FMSRP) and quadrant SRP (QSRP) in patients with chronic periodontitis (ChP).

METHODS: Twenty females and five males diagnosed with ChP were randomly assigned to one of three groups: FMD, FMSRP within 24 hours, or QSRP in weekly intervals. FMD consisted of SRP within 24 hours along with subgingival, tongue, tonsil, and rinse application of chlorhexidine. FMSR consisted of scaling performed within 24 hours without chlorhexidine. QSRP was performed by treating one quadrant weekly without chlorhexidine. Clinical parameters, including PD, CAL, BOP, PII, and API, were recorded at baseline, one, two, four, and eight months after treatment.

RESULTS: All treatment modalities resulted in significant improvements in clinical parameters at all time points as compared with baseline. At the first and second months, either FMD or FMSRP showed significant improvements when compared with the other treatment dependent on site and pocket depth; however, no significant difference remained between any groups in clinical parameters at eight months. Periodontopathogens were reduced in all groups immediately after treatment and further decreased by eight months, although a significant reduction in total bacterial load was only noted in the FMD group after eight months. *A. actinomycetemcomitans* was significantly reduced by QSRP and FMSRP immediately following 24 hours and maintained after eighth months. PD at eight months was correlated with both *A. actinomycetemcomitans* and *P. intermedia* in the FMSRP group.

CONCLUSION: All three treatments were successful in improving clinical parameters and reducing periodontopathic burden with no significant benefit noted of any one treatment over the others at eight months.

BOTTOM LINE: No advantage to one-stage full-mouth disinfection over quadrant or full-mouth scaling.

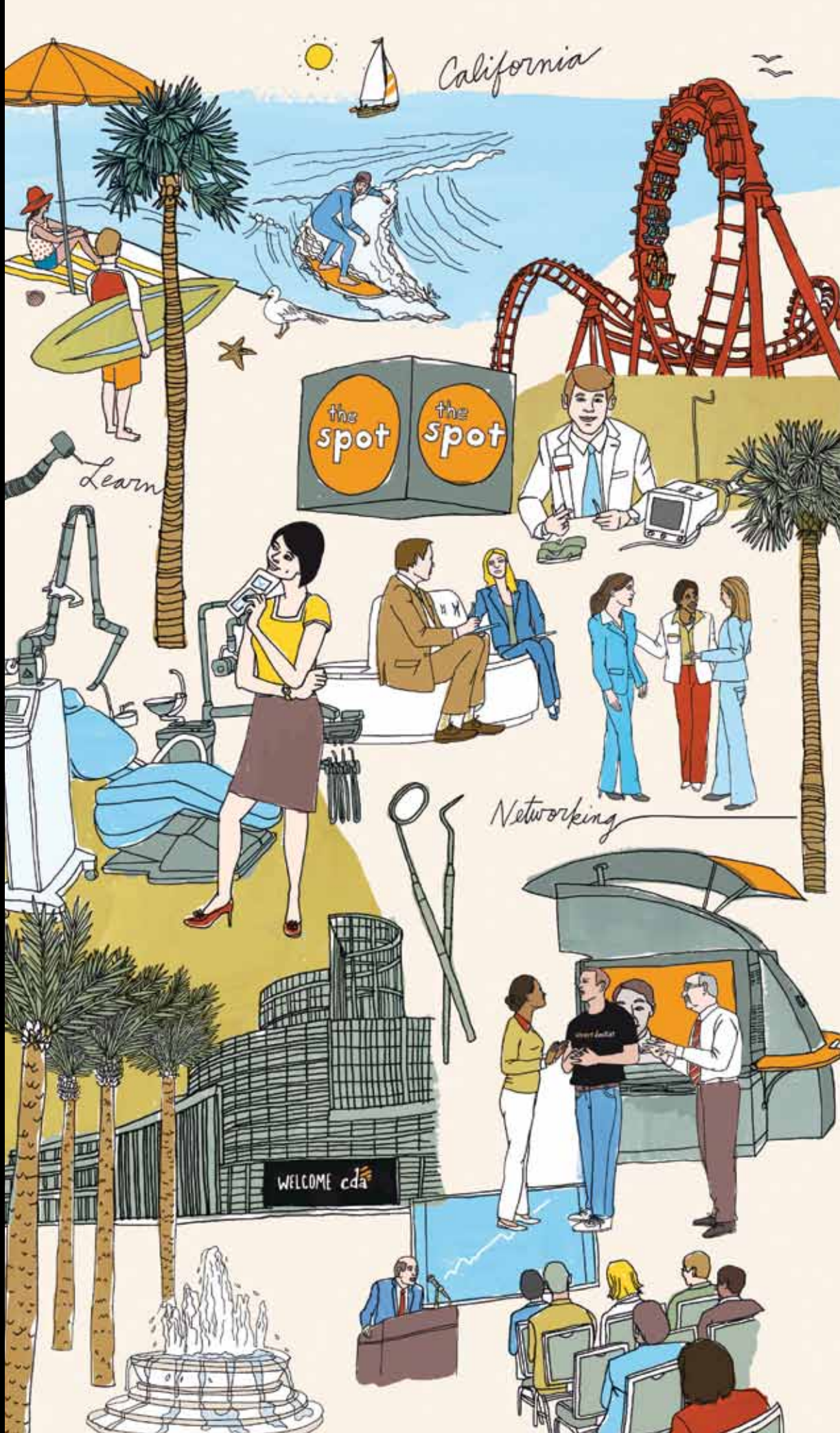
cda PRESENTS

The Art and Science of Dentistry

Anaheim, California

May 12-14, 2011

New days: Thursday-Saturday



Top Tips for Receiving C.E.

- **Plan ahead** — Arrive at least 15 minutes early to all courses, and plan an alternate course in the event that your preferred course is full. Doors close at the start of the lecture, and late arrivals will not be admitted.
- **License numbers matter** — When registering, include the license numbers and formal names of all licensed attendees to ensure C.E. credits are granted.
- **Scan in and out of each course** — Arrival and departure times are used to issue C.E. credits. Scan upon entry and exit, and remain in the course the entire time. Partial credit cannot be granted. Credit cannot be given for overlapping course times or incomplete course attendance.
- **Write down course codes** — During each course, the host will give attendees a three-digit code that should be recorded and saved until you have your complete official C.E. certificate after the convention.
- **Go to the C.E. Pavilion or cdapresents.com after attending class** — At the C.E. Pavilion, you will verify your C.E. units as well as take a brief survey for each course attended. For your convenience, you can wait until you have attended all of your courses to verify, or visit cdapresents.com up to five days after the meeting. Please keep in mind that all courses displayed in the C.E. Pavilion are those that have on-site scan activity and display does not guarantee credit.
- **Print your certificate online** — To make your C.E. certificates available in a timelier manner, **certificates will now be available online approximately three to four weeks after the meeting.** At that time, you will receive an e-mail containing a link that will take you to your C.E. certificate. You may also access your C.E. certificate at cdapresents.com. Should you need a copy of your certificate mailed to you, please call 800.232.7645 approximately four weeks after the meeting, and we will be happy to mail you a copy.

Visit cdapresents.com to plan your meeting experience.

Big changes often start small.

In an effort to do our part for the environment and save our members money, *CDA Presents* will no longer print course handouts for classes in Anaheim and San Francisco. A small effort that will save over 1.3 million pieces of paper each year. Plus, by investing the savings, we can continue to enhance the benefits of *CDA Presents* for members and their teams.

Attendees can access most course handouts at cdapresents.com and are welcome to print them out if they wish. In addition, each show's On-Site Guide will now provide space for note taking. And as always, audio recordings of most classes will be available for purchase at the conclusion of each show. By working together, we can do great things.

cda® PRESENTS

THURSDAY, MAY 12, 2011

Diane Morgan-Arns

California Dental Practice Act

Time: 5–7 p.m.
Course #: 001
Fee: $20

Tricia Osuna, RDH, BS, FAADH

Infection Control

Time: 7–9 a.m.
Course #: 002
Fee: $20

FRIDAY, MAY 13, 2011

Diane Morgan-Arns

California Dental Practice Act

Time: 7–9 a.m.
Course #: 003
Fee: $20

Tricia Osuna, RDH, BS, FAADH

Infection Control

Time: 5–7 p.m.
Course #: 004
Fee: $20

SATURDAY, MAY 14, 2011

Arthur W. Curley, JD

California Dental Practice Act

5–7 p.m.
Course #: 005
Fee: $20

Tricia Osuna, RDH, BS, FAADH

Infection Control

Time: 7–9 a.m.
Course #: 006
Fee: $20

Required courses will be audio recorded and available for purchase.

California Dental Practice Act and Infection Control — Ticketed Admission Only

The Dental Board of California mandates continuing education in infection control and the California Dental Practice Act for license and permit renewal. CDA is proud to present the following courses that will fulfill these required units for license renewal.

Please note:

- Admission to these C.E. courses will be by ticket only.
- You may purchase your ticket in advance at cdapresents.com or by completing the registration form on Page 13. Tickets are $20 and will guarantee your seat in the course.
- If available, tickets will also be sold on-site at the Ticket Booth located in the registration area of the Anaheim Convention Center.
- There will be no late entries allowed. The California mandatory education requires 2 full hours for credit. It is strongly recommended that you arrive a minimum of 15 minutes in advance of the starting time.
- Seating is limited. Tickets will be sold on a first-come, first-served basis.

Infection Control for California

Dental Board requirement for 2 units: This program provides you with the latest educational requirements specific to CCR section 1005, the Dental Board of California Infection Control Regulations.

Note: This 2-hour course does not meet the new infection control education requirement that unlicensed dental assistants take an 8-hour infection control course.

California Dental Practice Act

Dental Board requirement for 2 units: This course meets the new C.E. requirement for California Dental Practice Act education, including the new one-time course requirement for unlicensed dental assistants.

EXHIBIT HALL INFORMATION

CDA Presents will feature more than 550 exhibiting companies showcasing the latest in dental technology, products and services. Stay ahead of the curve by exploring the innovative new products being launched in the exhibit hall.

Please note new days:
Thursday–Saturday,
May 12–14, 2011

Grand Opening
Thursday, 9:30 a.m.

New Exhibit Hall Days and Hours
Thursday, May 12, 9:30 a.m.–5:30 p.m.
Friday, May 13, 9:30 a.m.–6 p.m.
Saturday, May 14, 9:30 a.m.–4:30 p.m.

Family Hours
Daily, 9:30 a.m.–noon

Visit cdapresents.com to maximize your tradeshow experience.

the spot

The meeting place to learn, engage and recharge!

Featuring:

- An educational theater providing C.E. credits
- Cool and new products
- Internet Café and Wi-Fi lounge
- C.E. stations

Experience it.

Anaheim Convention Center

Exhibit Hall, near Registration Area

WineFUNdamentals Seminar and Reception

Join us for interactive wine activities and trivia! You'll learn to distinguish the various scents and flavors in wine by tasting both white and red varietals and about pairings with both cheese and chocolate. Plus, you'll have the opportunity to put your knowledge to the test and win prizes!

Friday, May 13

Time: 4–5:30 p.m.

Fee: $25

Event #: 056

Location: The Spot, Exhibit Hall

CDA is pleased to offer a children's program by KiddieCorp during *CDA Presents*. Questions regarding the children's program can be directed to KiddieCorp at 858.455.1718 or info@kiddiecorp.com. **Register online at kiddiecorp.com/cdaspringkids.htm.**

Please note: For the safety and productivity of all attendees, children 10 and younger will only be permitted on the exhibit floor from 9:30 to noon each day. A children's program is provided at the Hilton Anaheim Hotel each day. Additionally, a "Kid Zone" will be provided for ages 4–12 years old on the exhibit floor during exhibit hours for $5 per child. There is a daily three-hour maximum for each child.

Dates: May 12–14, 2011
Location: Hilton Anaheim Hotel, Third Floor (mezzanine)
Time: 7 a.m.–6 p.m. Thursday
7 a.m.–6 p.m. Friday
7 a.m.–4:30 p.m. Saturday

Ages 6 Months Through 6 Years

KiddieCorp professionals are bonded, qualified child care specialists who are carefully selected and trained. Age-appropriate activities are selected for the children who join them during the meeting.

Parents with infants must provide diapers, changing supplies, milk, formula, baby food, etc. Please label personal belongings and lunches. Nutritious snacks and beverages will be provided by KiddieCorp. Meals can be supplied by parents or purchased at the children's program registration area.

Cost: Full day: $40
Half day: $20 (7 a.m.–1 p.m. or 1–6 p.m.)

Youth Program for Ages 7 Through 12 Years

Specially designed for children 7 through 12 years old, this program by the professionals at KiddieCorp will keep your kids entertained while you attend lectures or visit the exhibit floor. Activities, games and movies will be provided in a structured environment for your child's entertainment.

Cost: Full day: $30
Half day: $15 (7 a.m.–1 p.m. or 1–6 p.m.)

Registration and Cancellation Deadline

The advance registration deadline is April 15, 2011. Advance registration is strongly encouraged. Cancellations received after April 15, 2011, will not be eligible for a refund.

No-Show Policy

Parents who do not arrive within 15 minutes of their reserved times will forfeit their reservations and not be eligible for a refund.

Stroller Check

For the convenience and safety of all attendees, strollers are not permitted on the exhibit floor. A stroller check will be available for $2 per item.

Kid Zone

A "Kid Zone" will be provided for ages 4–12 years old on the exhibit floor during exhibit hours. There is a daily three-hour maximum for each child. The cost is $5 for up to three hours.

For safety reasons, strollers are not permitted on the exhibit floor.

Prepaid Early Bird Parking

To make your parking experience easier, CDA is offering the opportunity to purchase parking vouchers in advance for the Anaheim Convention Center. Tickets will also be available at on-site registration for next day(s) use only. If you arrive by 8:30 a.m., this will guarantee a parking space with the added convenience of not worrying about having cash on hand. Purchase the tickets at **cdapresents.com** along with your registration.

The following conditions apply:

- Tickets are $12 per day and are available for Thursday, Friday and Saturday.
- Arrive by 8:30 a.m. — prepaid parking spaces will not be honored after that time.
- Parking passes are nonrefundable. Refunds cannot be given for lost or forgotten passes.
- Original passes must be used.
- Passes must be surrendered upon entry to the lot.
- Passes are only valid at the Anaheim Convention Center. They cannot be used at off-site parking or Disney lots.

Traffic and Parking Recommendations

If you are driving to the Convention Center, traffic is anticipated to be heaviest on Thursday and Friday mornings. To minimize any inconvenience, early arrival is strongly recommended. The peak traffic and parking time is projected to be from 8 to 11 a.m. Please watch the traffic control signs as you exit the freeway for the most updated parking information.

Off-Site Parking

CDA is working to secure off-site parking near the freeway exits with complimentary shuttle service to the Anaheim Convention Center. Due to scheduling of events at these venues, this can only be confirmed within a few weeks of our meeting. Please watch for additional information in your badge mailing, attendee e-mails or visit us at cdapresents.com for updated instructions the week prior to the meeting. The morning of, traffic signage will also provide direction.

Prepaid Food Vouchers

Treat your staff to lunch with vouchers for the Anaheim Convention Center concession areas. Available in increments of $10, vouchers allow a prepaid, hassle-free option to grab something quick or sit down and enjoy a meal with your team while attending the exhibit hall or between C.E. courses. Menu options include specialty coffee and breakfast items, Grab 'n' Go for lunch, Mexican taqueria, made-to-order sandwiches, All American Grill, barbecue, rice bowl and pizza. Exact locations and food selections will be included in your registration packet and on cdapresents.com. These vouchers are nonrefundable and must be used for amount shown. Change cannot be given if purchase is less than $10.

Purchasing Vouchers

Purchase prepaid food and parking vouchers when you register online at cdapresents.com or by submitting the advance registration form.

Prepaid Parking Voucher

Fee: $12

Event #: 059 Thursday
060 Friday
061 Saturday

Prepaid Food Voucher

Fee: $10

Event #: 062

Get ready to have a ball at the *CDA Presents* beach party! Attendees will enjoy tasty fish tacos, sliders, hot dogs, appetizers and other refreshments while grooving to the lively beach tunes of the Beach Toys Band. This entertaining group will have you singing, dancing and reminiscing to the songs of the Beatles and Beach Boys. Create a team with your colleagues and friends and enjoy a friendly match on the volleyball court, relax in a cabana, or if you prefer, visit one of our surf-side boardwalk games for some amusement. Join us for a tidal wave of fun, food and entertainment. *(Two complimentary beverages will be provided, and a cash bar will also be available throughout the evening.)*

Date: Friday, May 13, 2011

Time: 7–10 p.m.

Fee: $65 per person

Event #: 055

Location: Arena Plaza at the Convention Center

*Menu subject to change. Visit **cdapresents.com** for the latest information.*

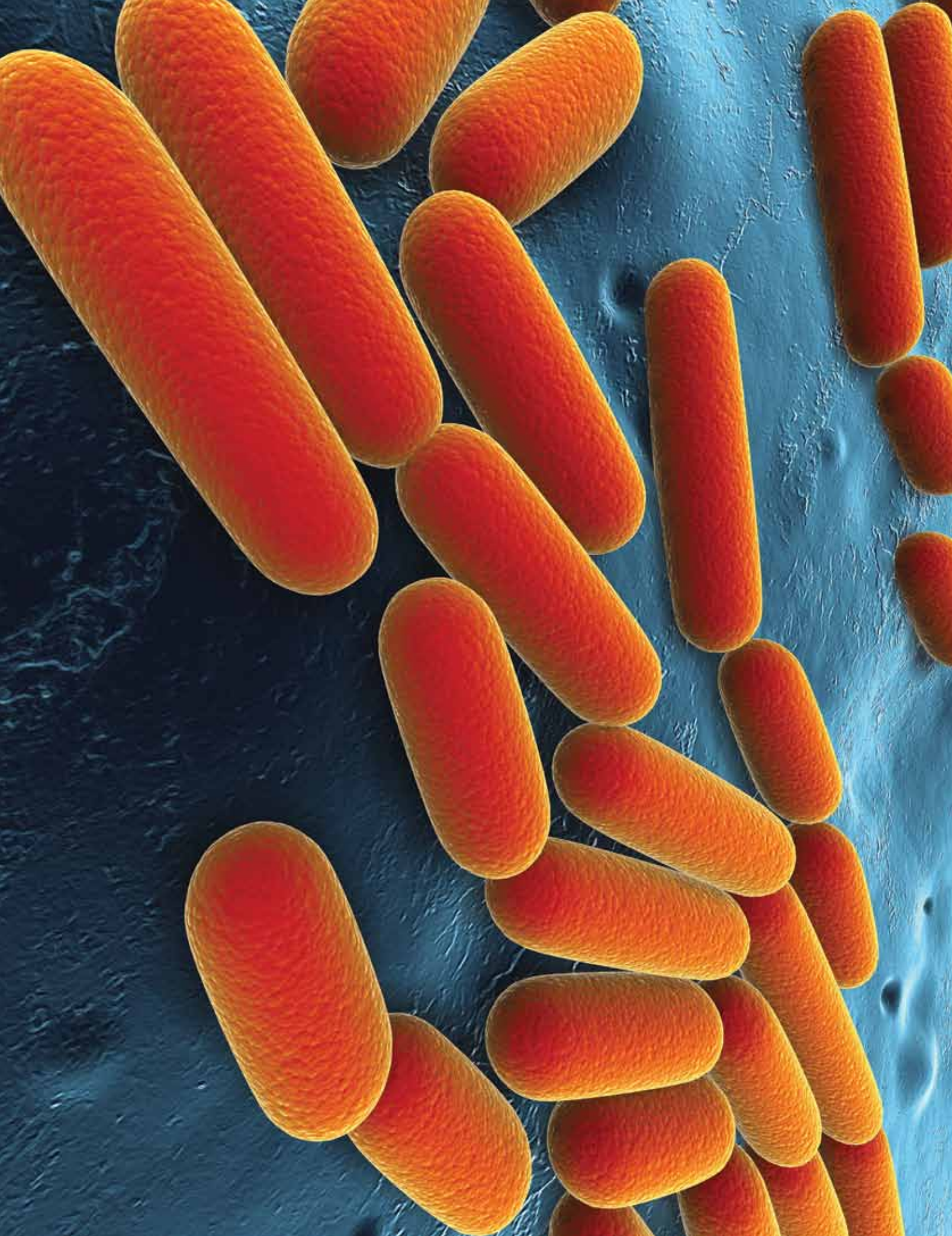
Significantly discounted *Disneyland*® Resort theme park tickets are available to attendees during *CDA Presents*. These tickets will only be available for purchase online. These tickets are created just for you, and not all are available at the front gates of theme parks. Buy in advance and save! To purchase these tickets, please visit cdapresents.com. Please note that purchase of theme park tickets is separate from *CDA Presents* registration. Ticket store closes at 9 p.m. PST on Saturday, May 7, 2011. **All tickets valid May 8–21, 2011.**

Disneyland RESORT
LET THE MEMORIES BEGIN

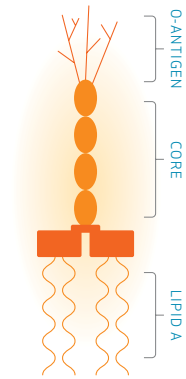
ONE DAY/ONE PARK	Admission to either *Disneyland*® Park or *Disney's California Adventure*® Park for one day.	Adult: Child (3–9 years):	$68 $60
ONE-DAY PARK HOPPER®	Admission and ability to visit both *Disneyland*® Park and *Disney's California Adventure*® Park on the same day for one day.	Adult: Child (3–9 years):	$88 $78
TWO-DAY PARK HOPPER®	Admission and ability to visit both *Disneyland*® Park and *Disney's California Adventure*® Park on the same day for two days.	Adult: Child (3–9 years):	$141 $126
THREE-DAY PARK HOPPER®	Admission and ability to visit both *Disneyland*® Park and *Disney's California Adventure*® Park on the same day for three days.	Adult: Child (3–9 years):	$161 $140
FOUR-DAY PARK HOPPER®	Admission and ability to visit both *Disneyland*® Park and *Disney's California Adventure*® Park on the same day for four days.	Adult: Child (3–9 years):	$171 $148
FIVE-DAY PARK HOPPER®	Admission and ability to visit both *Disneyland*® Park and *Disney's California Adventure*® Park on the same day for five days. *Enjoy two free days of magic when you visit both Disney's California Adventure*™ Park and *Disneyland*® Park for *five days for the price of three!*	Adult: Child (3–9 years):	$176 $151
TWILIGHT CONVENTION TICKET	An ideal admission option for after meetings or events! Admission is valid for one visit to either *Disneyland*® Park or *Disney's California Adventure*® Park after 4 p.m., or four hours before park closing, whichever is earlier, since park hours are subject to change. "Back and forth" privileges are not included.	Ages 3 and up:	$43

Tickets are printed on demand from your home computer. Purchase is separate from meeting registration.

NOTE: The special pricing on this page is available only with your advance, pre-arrival purchase. Box office tickets will be available at the *Disneyland*® Resort Main Gate Ticket Booths at regular prices. Prices subject to change.



CDA JOURNAL, VOL 39, Nº3



Endotoxin in Endodontic Infections: A Review

ZAHED MOHAMMADI, DMD, MSD

ABSTRACT Gram-negative bacteria play an essential role in primary endodontic infections. They have several virulence factors such as endotoxin, a large molecule that plays a role in the initiation and perpetuation of apical periodontitis. This paper reviews the role of gram-negative bacteria in endodontic infections, structure and mechanisms of action of endotoxin, endotoxin in infected root canals, effects of calcium hydroxide and polymixin B on endotoxin, and applications of endotoxin to measure leakage.

AUTHOR

Zahed Mohammadi, DMD, MSD, is an assistant professor and head, Department of Endodontics, Hamedan University of Medical Sciences, Hamedan, Iran, and Iranian Center for Endodontic Research (ICER), Tehran, Iran.

When dental pulp is exposed to the oral cavity due to caries or trauma, it is initially contaminated by predominantly aerobic and facultative microorganisms. Due mainly to the existing nutritional relationships between microorganisms, together with the slow decrease of oxygen tension in root canals, a microbial shift takes place leading to a predominance of anaerobic microorganisms.[1] Technical advances in microbiological culture and identification have shown that anaerobic microorganisms predominate in root canals of teeth with pulp necrosis and radiographically visible chronic periapical lesion, especially gram-negative bacteria.[2] The most frequently detected culturable species in primary infection belong to the gram-negative genera *Tannerella, Dialister, Porphyromonas, Prevotella, Fusobacterium, Campylobacter,* and *Treponema*. Furthermore, some gram-negative anaerobic bacteria have been suggested to be involved with symptomatic lesions.[3]

Lipopolysaccharide (Endotoxin)

Structure

The lipopolysaccharide (LPS) is located in the outer membrane of the bacterial cell wall.[4] It is composed of three distinct structural regions, the O-specific polysaccharide, the common core, and a lipid component called lipid A. Lipid A is responsible for many, if not all, biological activities exhibited by bacterial LPS.[4] Lipid A is a gluco-configured hexosamine-based phospholipid that serves as the hydrophobic anchor of LPS on the majority of gram-negative outer membranes. The majority of bacterial lipid A structure is conserved and consists of a mono- or bi-phosphorylated disaccharide backbone that has been acylated with C12-C14-

length hydroxy and nonhydroxy fatty acids at specific positions (C2, C3, C2', C3').[5] Furthermore, if present, the hydroxyl groups of these fatty acid chains can be further esterified by additional fatty acids (second substitution). The classic structure of lipid A is represented by *Escherichia coli*. This lipid A contains a one, 4-bi-phosphorylated β(1-6)-linked D-glucosamine disaccharide backbone (D-Glc N I, D-Glc N II) that is hexa-acylated via primary ester and amide linkages with secondary substitution on specific hydroxyl groups.[5]

Mechanisms of Action

When free to act, endotoxins do not cause cell or tissue damage directly, but they stimulate competent cells to release chemical mediators. It has been shown that macrophages are the main target of endotoxins. After release from bacteria, LPS is initially bound to a plasma protein called LPS-binding protein (LBP) and is then delivered to CD14, a cell receptor for LPS on the surface of macrophages. Subsequent activation of the macrophage is a result of a signal triggered by a signal-transducing receptor called a toll-like receptor (TLR).[6]

Toll-Like Receptors (TLRs)

TLRs are evolutionarily conserved proteins characterized by an extracellular leucine-rich repeat domain and an intracellular Toll/IL-1 receptor-like (TIR) domain.[7] Leucine-rich repeats are found in both cytoplasmic and transmembrane proteins and are involved in ligand recognition and signal transduction.[8] It has been demonstrated that seven out of 10 leucine-rich repeat motifs of the CD14 receptor, a transmembrane protein implicated in LPS recognition, could be deleted without affecting LPS binding.[9] Furthermore, each TLR can recognize the most diverse ligands, lacking any structural similarity, making it hard to conceive how one motif can interact with all these molecules. The intracellular domain of the TLRs, the TIR domain, is a conserved protein-protein interaction module that is also found in a number of transmembrane and cytoplasmic proteins in plants, worms, arthropods, and even bacteria.

Interestingly, all these TIR-containing proteins seem to have a function in host defense, making the TIR domain one of the earliest signaling motifs to evolve.[10] The region of homology is confined to three conserved boxes containing amino acids crucial for signaling.[11] An extending loop in box 2, encompassing an RDxϕ1ϕ2G motif (where x represents any amino acid and ϕ represents a hydrophobic residue) mediates interaction with the downstream adaptor protein MyD88.[12] The LPSd nonresponder phenotype of CH3/HeJ mice results from a Pro→His mutation at the ϕ2 position in this loop in the TIR domain of TLR4, which impairs interaction with the adaptor signaling protein MyD88, resulting in abrogation of the LPS response.[12] The ϕ2 proline residue is conserved in all TLRs except TLR3, where it is replaced with another hydrophobic residue.[13]

WHEN FREE TO ACT, endotoxins do not cause cell or tissue damage directly, but they stimulate competent cells to release chemical mediators.

Biological Activities of LPS

Besides TLRs, there are some other pathways regarding the biological effects of LPS. It activates the Hageman factor (factor XII of coagulation), the first step of the intrinsic clotting system that triggers the coagulation cascade or the production of bradykinin.[14-16] LPS also activates the complement system 6, induces the expression of leukocyte adhesion molecules on endothelial cells, and stimulates osteoclast differentiation and bone resorption, particularly via interactions with TLR-4 on osteoblast-lineage cells.[17-20] LPS may be mitogenic to B-cells and epithelial cells. It also can stimulate B-cells in the absence of T-cells help.[21] Wadachi and Hargreaves proposed a mechanism of pain associated with endodontic infections.[22] They demonstrated that trigeminal afferent neurons express the TLR4 and CD14 receptor complex and that LPS activation of TLR-4/CD14 may trigger intracellular signaling cascades, leading to peripheral release of neuropeptides and central nociceptive neurotransmission.

LPS in Infected Root Canal

Schein and Schilder showed that pulpless teeth contained greater concentrations of endotoxin than those with vital pulps.[23] Symptomatic teeth also contained more endotoxin than asymptomatic teeth. Dwyer and Torabinejad examined the periapical tissue reaction to three concentrations of *E. coli* endotoxin solutions, to three detoxified *E. coli* endotoxin solutions, and to a sterile saline as a control solution in adult cats.[24] The maxillary and mandibular canines were isolated with a rubber dam, and the pulps were extirpated. The solutions were deposited in the root canals of each cat, and the access cavities were sealed. The periapical tissues were examined histologically and radiographically at two, four, and six weeks. The radiographic and histologic results indirectly demonstrated that endotoxins had a part in initiating and perpetuating periapical inflammatory lesions. Pitts et

al. investigated the role of endotoxin in periapical inflammation.[25] Dental pulps in two dogs were removed and the canals shaped in six matched pairs of roots.

Canals on the experimental side were injected with *Salmonella Minnesota* R-595 endotoxin and canals on the contralateral control side were injected with saline solution at weekly intervals. Radiographic examinations were performed weekly, and histologic evaluations were made at four to five weeks. Periapical radiographic changes occurred sooner and to a more severe degree with the roots containing endotoxin than with the roots containing saline solution. Histologic evaluation showed greater periapical bone destruction and a more marked inflammatory response. Polymorphonuclear leukocytes were the predominating cells. Pinero et al. assessed the effect of endotoxin on the synthesis of connective tissue matrix components by pulp fibroblasts in vitro.[26]

Human and bovine pulp fibroblasts were treated with low levels of endotoxin and assayed for the utilization of various isotopes to measure synthesis of DNA, collagen, and sulfated and nonsulfated glycosaminoglycans. Endotoxin at 5 to 125 µg/ml stimulated the uptake of 3H-thymidine by both cell lines. Utilization of the other isotopes also increased but varied with the cell lines and endotoxin concentrations. Mattison et al. examined periapical bone reaction to *Eikenella corrodens* endotoxin in adult mongrel dogs.[27] Mandibular third and fourth premolars were biomechanically prepared and injected with *E. corrodens* 23834 endotoxin, *E. coli* 055:B5 endotoxin, or pyrogen-free water at weekly intervals for four weeks. Radiographs and blood samples were obtained weekly for 12 weeks and one animal was killed for histological evaluation at the end of the test period. Radiographically, the most rapidly progressing and most extensive lesions in periapical bone were observed in those canals treated with *E. corrodens* endotoxin. No antibody titers were detected in sera from any of the dogs during the observation period.

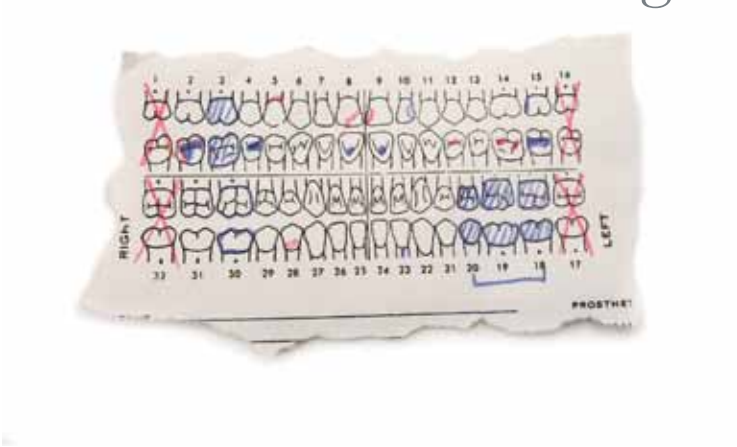
Histological examination showed significant bone destribution and heavy inflammatory cell infiltrate. Yamasaki et al. measured the amount of endotoxin as well as to identify gram-negative bacteria in experimental periapical lesions in rats and found that the amount of endotoxin in the periapical tissues gradually increased with increasing time and that gram-negative bacteria were isolated from the same region but did not increase in number concurrently with the increase in the amount of endotoxin.[28] Nissan et al. developed an in vitro system to determine whether bacterial endotoxin was capable of diffusing through dentin without the use of filtration pressure.[29] Cavities were prepared in five third molar teeth in order to produce a split chamber device consisting of occlusal and pulpal chambers with 0.5 mm of intervening dentin. An endotoxin was introduced into the occlusal chamber and the effluent in the pulpal chamber was sampled every 30 minutes for five hours and at 24 hours using the limulus lysate assay. In four specimens, the initial appearance of endotoxin in the effluent ranged from 15 minutes to 4½ hours. In two specimens, the concentration of endotoxin in the effluent leveled off in 4½ and 5 hours, respectively, whereas in another two the concentration continued to increase throughout the experiment. In one specimen, no endotoxin was detected. Nakane et al. treated human dental pulp cells with 1, 10, and 100 µ/ml of LP).[30]

PERIAPICAL RADIOGRAPHIC changes occurred sooner and to a more severe degree with the roots containing endotoxin than with the roots containing saline solution.

The effects of treatment were examined by measurement of the DNA content, protein content, and alkaline phosphatase activity of the cells. LPS samples were purified from *P. gingivalis, P. endodontalis,* and *F. nucleatum* isolated from root canals, and *E. coli* 0111:B4 LPS was used as a positive control. At a concentration of 1 µ/ml, none of the LPSs caused any change in the production of DNA or protein, whereas the amount of DNA was increased at 10 micrograms/ml and inhibited at 100 micrograms/ml. Protein synthesis was decreased by LPSs at both 10 and 100 micrograms/ml. Alkaline phosphatase activity was not changed at any concentration of LPS tested. Nagaoka et al. found that pulpal fibroblasts were immunoresponsive cells and can elaborate IL-8 upon stimulation with *P. intermedia* LPS.[31] Hosoys and Matsushima demonstrated that *Porphyromonas endodontalis* LPS stimulated IL-1 beta release from human dental pulp cells in a time- and dose-dependent manner.[32] However, IL-1 beta converting enzyme activity was not increased by *P. endodontalis* LPS. Furthermore, Northern blot hybridization analysis revealed that the IL-1 beta mRNA level in human dental pulp cells was increased by *P. endodontalis* LPS. Ko and Lim demonstrated that *P. endodontalis* LPS was capable of stimulating PMNs to produce chemotactic cytokines and suggested that PMNs stimulated with *P. endodontalis* LPS might

CONTINUES ON 158

Sure, you could do dental charting blindfolded.



It's providing care to an entire family that's the real eye opener.

Whether they're divorced, foster or nuclear, when caring for families, having the right forms and asking the right questions are essential. Thankfully, there's cdacompass.com. From coordinated benefits between divorced parents to authorization forms so a caretaker can accompany a minor to an appointment, it's one website that gives your front office the foresight it needs to make treating families a snap.

cdacompass.com | where smart dentists get smarter.™

cda PRACTICE SUPPORT CENTER SM

CDA JOURNAL, VOL 39, Nº3

CONTINUED FROM 155

play a crucial role in the inflammatory and immunopathological reactions of pulpal and periapical diseases.[33]

Tokuda et al. indicated that *P. intermedia* LPS-induced IL-10R gene expression in human dental pulp fibroblasts in vitro.[34] Fouad and Acosta compared periapical lesion progression and the expression of the bone modulating cytokines (IL-1α, TNF-α, IL-4, IL-6 and IL-11) in periapical lesions of normal and C3H/HeJ (LPS hyporesponsive) mice.[35] Findings showed that there were no statistically significant differences in progression of periapical lesions for both mouse strains with time. Furthermore, the immunohistochemical staining revealed no overall differences between the two strains in levels of expression of the cytokines. IL-11 expression did not change from control levels in BALB/c mice, but correlated with the expression of IL-6 and IL-4 in C3H/HeJ mice.

Calcium Hydroxide and Endotoxin

Safavi and Nichols evaluated the effect of calcium hydroxide on the endotoxin of *Salmonella typhimurium* in vitro and found that it hydrolyzed the highly toxic lipid A molecule.[36] In another study on the *P. intermedia* endotoxin, researchers found that Ca(OH)2 transformed lipid A into fatty acids and amino sugars which were atoxic.[4] Barthel et al. investigated the effect of Ca(OH)2 on the toxic potential of an *E. coli* LPS.[37] Findings indicated that Ca(OH)2 was able to eliminate the ability of *E. coli* LPS to stimulate TNF-alpha production in peripheral blood monocytes. In in vivo studies, Nelson-Filho et al., as well as Silva et al., evaluated the effect of endotoxin plus Ca(OH)2 on apical and periapical tissues of a dog's teeth radiographically and found that the endotoxin caused the formation of periapical lesions and that Ca(OH)2 inactivated bacterial LPS.[38,39]

Tanomaru et al. evaluated the effect of biomechanical preparation using different irrigating solutions and a Ca(OH)2-based root canal dressing in a dog experimental tooth model containing endotoxin.[40] Results showed that biomechanical preparation with only irrigating solutions did not inactivate the endotoxin, however, the same treatment associated with the use of the Ca(OH)2 root canal dressing was effective in the inactivation of the toxic effects of this endotoxin. Jiang et al. in 2003 also evaluated the direct effects of LPS on osteoclastogenesis and the capacity of Ca(OH)2 to inhibit the formation of osteoclasts stimulated by endotoxin and found that Ca(OH)2 significantly reduced osteoclast differentiation.[41] Buck et al. in 2001 found that long-term Ca(OH)2 as well as 30-minute exposure to an alkaline mixture of chlorhexidine, ethanol, and sodium hypochlorite did detoxify LPS molecules by hydrolysis of ester bonds in the fatty acid chains of the lipid A moiety.[42]

IN PATIENTS
with sepsis, continuous hemodialysis therapy with polymyxin-B immobilized fiber have been correlated with improvement of the survival rates.

Ploymyxin B and Endotoxin

Polymyxins are a group of polypeptide cationic antibiotics.[43] Major components of this class of antimicrobial agents that have been used in clinical practice represent colistin (polymyxin E) and polymyxin B. Colistin and polymyxin B were discovered from different species of bacillus polymyxa in the 1940s and were extensively used parenterally for approximately two decades, after which they were gradually withdrawn from clinical practice owing to reports of toxicity.[44-48]

Polymyxins consist of a cyclic decapeptide molecule, which is positively charged and linked to a fatty acid chain that has been found to be either 6-methyl-octanic acid or 6-methyl-eptanoic acid. The main difference between the molecules of polymyxin B and polymyxin E is in the amino acid components.[43] Polymyxin E consists of D-leucine, L-threonine and L-αγ-diaminobutyric acid, while polymyxin B contains D-phenylalanine instead of D-leucine.[43] The cationic molecules of polymyxin B and polymyxin E compete and displace Ca2+ and Mg2+ ions, which normally stabilize the lipopolysaccharide molecule of the outer membrane of gram-negative bacteria. This displacement causes local disturbance of the cell membrane, increased cell permeability, leakage of the cell content, cell lysis, and death.[49,50] In addition, a remarkable property of polymyxins is the ability to neutralize lipopolysaccharide molecules of gram-negative bacteria, thus inducing antiendotoxin activities.[51]

In patients with sepsis, continuous hemodialysis therapy with polymyxin-B immobilized fiber have been correlated with improvement of the survival rates.[52] Their spectrum of activity includes gram-negative aerobic bacilli only, including *Acinetobacter baumannii, Pseudomonas aeruginosa, Klebsiella* species, *Enterobacter* species, *Salmonella* species, *Shigella* species and *E. coli*. *Stenotrophomonas maltophilia* strains are usually susceptible to polymyxins.[53,54] On the other hand, *Proteus* species, *Serattia* species, *Burkholderia* species, *Providencia* species and *Edwardsiella* spp. are resistant to polymyxins.[53] Oliveira et al. showed that polymyxin B as an intracanal medica-

ment for seven days detoxified endotoxin in root canals and altered the properties of LPS to stimulate antibody production by B-lymphocytes.[55] Hong et al. verified that systemic administration of polymyxin B in rats reduced the extent of periapical lesion-associated bone resorption by 76 percent to 80 percent.[56]

Endotoxin to Assess Leakage

There are several methods to assess leakage. One of these techniques is using endotoxin. Tang et al. used endotoxin to compare the sealing ability of Super-EBA, IRM, amalgam, and MTA.[57] Results showed that MTA permitted less endotoxin leakage than IRM and amalgam at one, two, six and 12 weeks, and leaked less than Super-EBA at two weeks and 12 weeks. Carratu et al. evaluated the time required for endotoxins and bacteria to penetrate through root-canal obturations performed with vertical and lateral gutta-percha condensation techniques.[58] Specimens prepared by the two alternative methods were exposed to contaminated saliva, and leakage into the root was evaluated over time. Findings demonstrated that none of the obturated roots was infiltrated by endotoxins after 31 days. On the contrary, between Day 13 and Day 37, bacteria had infiltrated all specimens. Williamson et al. assessed the magnitude of endotoxin penetration through root canal treated teeth using a dual chamber model system.[59] Forty-four maxillary anterior teeth were prepared endodontically and canals filled either by lateral condensation or a warm thermoplasticized technique in combination with either Roth's 801 or AH 26 sealer. Teeth were suspended in the model system with a mixed anaerobic bacterial suspension in the upper chamber and HBSS in the lower chamber. The QCL-1000 LAL assay was used to measure endotoxin at 0, 1, 7, 14, and 21 days. Results showed that thermoplasticized root canal filling/Roth's 801 sealer permitting the least apical endotoxin penetration. Gulabivala et al. used radiolabelled LPS to assess the coronal seal of retrograde amalgam fillings. Three different designs of retrograde cavities were evaluated: the conventional class 1 cavity, the slot cavity, and a previously unreported approach, the funnel cavity. Findings showed that retrograde fillings in the funnel cavity leaked significantly less than those in the other two cavity designs.

Conclusions

- Gram-negative bacteria play an essential role in primary endodontic infections.
- LPS is one of the major virulence factors of gram-negative bacteria, which play a fundamental role in the initiation and maintenance of periapical inflammation.
- TLR-4 is involved in cellular activation by LPS from most bacteria.
- LPS is present in infected root canals and its concentration proportional to the number of cells of gram-negative bacteria.
- Calcium hydroxide and polymixin B are potent inhibitors of endotoxin. ■■■■

REFERENCES

1. Sundqvist G, Figdor D, Life as an endodontic pathogen. *Endod Top* 6:3-28, 20032.
2. Fouad AF, Endodontic Microbiology. Wiley-Blackwell, pages 40-67, 2009.
3. Siqueira JF, Update on endodontic microbiology: candidate pathogens and patterns of colonization. *Endod Pract Today* 2:7-20, 2009.
4. Safavi KE, Nichols FC., Alteration of biological properties of bacterial lipopolysaccharide by calcium hydroxide treatment. *J Endod* 20:127-9, 1994.
5. Dixon DR, Darveau RP, Lipopolysaccharide heterogeneity: innate host responses to bacterial modification of lipid A structure. *J Dent Res* 84:584-95, 2005.
6. Leonardo MR, da Silva RA, et al, Importance of bacterial endotoxin (LPS) in endodontics. *J Appl Oral Sci* 12:93-8, 2004.
7. Medzhitov R, Preston-Hurlburt P, Janeway CA, A human homologue of the Drosophila toll protein signals activation of adaptive immunity. *Nature* 388:394-7, 1997.
8. Kobe B, Deisenhofer J, Proteins with leucine-rich repeats. *Curr Opin Struct Biol* 5:409-16, 1995.
9. Juan TS, Kelley MJ, et al, Soluble CD14 truncated at amino acid 152 binds lipopolysaccharide (LPS) and enables cellular response to LPS. *J Biol Chem* 270:1382-7, 1995.
10. Aravind LV, Dixit M, Koonin EV, The domains of death: evolution of the apoptosis machinery. *Trends Biochem Sci* 24:47-53, 1999.
11. Slack JL, Schooley K, et al, Identification of two major sites in the type I interleukin-1 receptor cytoplasmic region responsible for coupling to proinflammatory signaling pathways. *J Biol Chem* 275:4670-8, 2000.
12. Xu Y, Tao X, et al, Structural basis for signal transduction by the toll/interleukin-1 receptor domains. *Nature* 408:111-5, 2000.
13. Kaisho T, Akira S, Dendritic-cell function in toll-like receptor and MyD88-knockout mice. *Trends Immunol* 22:78-83, 2001.
14. Pettinger WA, Young R, Endotoxin-induced kinin (bradykinin) formation: activation of Hageman factor and plasma kallikrein in human plasma. *Life Sci* 9:313-22, 1970.
15. Morrison DC, Cochrane CG, Direct evidence for Hageman factor (factor XII) activation by bacterial lipopolysaccharides (endotoxins). *J Exp Med* 140:797-811, 1974.
16. Bjornson HS, Activation of Hageman factor by lipopolysaccharides of *Bacteroides fragilis, Bacteroides vulgatus,* and *Fusobacterium mortiferum. Rev Infect Dis* 6(suppl 1):S30-33, 1984.
17. Grandel U, Grimminger F, Endothelial responses to bacterial toxins in sepsis. *Crit Rev Immunol* 23:267-99, 2003.
18. Jersmann HP, Hii CS, et al, Bacterial lipopolysaccharide and tumor necrosis factor alpha synergistically increase expression of human endothelial adhesion molecules through activation of NF-kappaB and p38 mitogen-activated protein kinase signaling pathways. *Infect Immun* 69:1273-79, 2001.
19. Huang K, Fishwild DM, et al, Lipopolysaccharide-induced E-selectin expression requires continuous presence of LPS and is inhibited by bactericidal/permeability-increasing protein. *Inflammation* 19:389-404, 1995.
20. Zou W, Bar-Shavit Z, Dual modulation of osteoclast differentiation by lipopolysaccharide. *J Bone Miner Res* 17:1211-8, 2002.
21. Janeway CA, Travers P, Immunobiology. The immune system in health and disease, third ed., London, Current Biology Ltd, 1997.
22. Wadachi R, Hargreaves KM, Trigeminal nociceptors express TLR-4 and CD14: a mechanism for pain due to infection. *J Dent Res* 85:49-53, 2006.
23. Schein B, Schilder H, Endotoxin content in endodontically involved teeth. *J Endod* 1:19-21, 1975.
24. Dwyer TG, Torabinejad M, Radiographic and histologic evaluation of the effect of endotoxin on the periapical tissues of the cat. *J Endod* 7:31-5, 1980.
25. Pitts DL, Williams BL, Morton TH Jr., Investigation of the role of endotoxin in periapical inflammation. *J Endod* 8:10-8, 1982.
26. Pinero GJ, Kiatpongsah S, et al, The effect of endotoxin on the synthesis of connective tissue matrix components by pulp fibroblasts in vitro. *J Endod* 9:2-7, 1983.

27. Mattison GD, Haddix JE, et al, The effect of *Eikenella corrodens* endotoxin on periapical bone. *J Endod* 13:559-65, 1987.
28. Yamasaki M, Nakane A, et al, Endotoxin and gram-negative bacteria in the rat periapical lesions. *J Endod* 18:501-4, 1992.
29. Nissan R, Segal H, et al, Ability of bacterial endotoxin to diffuse through human dentin. *J Endod* 21:62-4, 1995.
30. Nakane A, Yoshida T, et al, Effects of lipopolysaccharides on human dental pulp cells. *J Endod* 21:128-30, 1995.
31. Nagaoka S, Tokuda M, et al, Interleukin-8 gene expression by human dental pulp fibroblast in cultures stimulated with *Prevotella intermedia lipopolysaccharide*. *J Endod* 22:9-12, 1996.
32. Hosoys S, Matsushima K, Stimulation of interleukin-1 beta production of human dental pulp cells by Porphyromonas endodontalis lipopolysaccharide. *J Endod* 23:39-42, 1997.
33. Ko HJ, Lim SS, Production of macrophage inflammatory protein (MIP)-1alpha and MIP-1beta by human polymorphonuclear neutrophils stimulated with *Porphyromonas endodontalis lipopolysaccharide*. *J Endod* 28:754-7, 2002.
34. Tokuda M, Miyamoto R, et al, Substance P enhances expression of lipopolysaccharide-induced inflammatory factors in dental pulp cells. *J Endod* 30:770-4, 2004.
35. Fouad AF, Acosta AW, Periapical lesion progression and cytokine expression in an LPS hyporesponsive model. *Int Endod J* 34:506-13, 2001.
36. Safavi KE, Nichols FC, Effect of calcium hydroxide on bacterial lipopolysaccharide. *J Endod* 19:76-8, 1993.
37. Barthel CR, Levin LG, et al, TNF-alpha release in monocytes after exposure to calcium hydroxide treated *Escherichia coli* LPS. *Int Endod J* 30:155-9, 1997.
38. Nelson-Filho P, Leonardo MR, et al, Radiographic evaluation of the effect of endotoxin (LPS) plus calcium hydroxide on apical and periapical tissues of dogs. *J Endod* 28:694-6, 2002.
39. Silva LA, Nelson-Filho P, et al, Effect of calcium hydroxide on bacterial endotoxin in vivo. *J Endod* 28:94-8, 2002.
40. Tanomaru JM, Leonardo MR, et al, Effect of different irrigation solutions and calcium hydroxide on bacterial LPS. *Int Endod J* 36:733-9, 2003.
41. Jiang J, Li H, et al, Quantitative analysis of osteoclast-specific gene markers stimulated by lipopolysaccharide. *J Endod* 32:742-6, 2006.
42. Buck RA, Cai J, et al, Detoxification of endotoxin by endodontic irrigants and calcium hydroxide. *J Endod* 27:325-7, 2001.
43. Michalopoulos AS, Tsiodras S, et al, Colistin treatment in patients with ICU-acquired infections caused by multiresistant gram-negative bacteria: the renaissance of an old antibiotic. *Clin Microbiol Infect* 11:115-21, 2005.
44. Fekety FR Jr, Norman PS, Cluff LE, The treatment of gram-negative bacillary infections with colistin. The toxicity and efficacy of large doses in four patients. *Ann Intern Med* 57:214-29, 1962.
45. Koyama Y, Kurosasa A, et al, A new antibiotic "colistin" produced by spore-forming soil bacteria. *J Antibiot* 3:457-8, 1950.
46. Nord NM, Hoeprich PD, Polymyxin B and colistin. A critical comparison. *N Engl J Med* 270:1030-5, 1964.
47. Yow EM, Tan E, et al, Colistin (coly-mycin) in resistant bacterial infections. A clinical appraisal. *Arch Intern Med* 108:664-70, 1961.
48. Flanagan AD, Adverse effects of sodium colistimethate. *Ann Intern Med* 74:143-4, 1971.
49. Davis SD, Iannetta A, Wedgwood RJ, Activity of colistin

against *Pseudomonas aeruginosa*: inhibition by calcium. *J Infect Dis* 124:610-2, 1971.
50. Newton BA, The properties and mode of action of the polymyxins. *Bacteriol Rev* 20:14-27, 1956.
51. Gough M, Hancock RE, Kelly NM, Antiendotoxin activity of cationic peptide antimicrobial agents. *Infect Immun* 64:4922-7, 1996.
52. Suzuki H, Nemoto H, et al, Continuous hemodiafiltration with polymyxin-B immobilized fiber is effective in patients with sepsis syndrome and acute renal failure. *Ther Apher* 6:234-40, 2002.
53. Gales AC, Reis AO, Jones RN, Contemporary assessment of antimicrobial susceptibility testing methods for polymyxin B and colistin: review of available interpretative criteria and quality control guidelines. *J Clin Microbiol* 39:183-90, 2001.
54. Hogardt M, Schmoldt S, et al, Pitfalls of polymyxin antimicrobial susceptibility testing of *Pseudomonas aeruginosa* isolated from cystic fibrosis patients. *J Antimicrob Chemother* 54:1057-61, 2004.
55. Oliveira LD, Leão MV, et al, In vitro effects of calcium hydroxide and polymyxin B on endotoxins in root canals. *J Dent* 33(2):107-14, 2005.
56. Hong CY, Lin SK, et al, The role of lipopolysaccharide in infectious bone resorption of periapical lesion. *J Oral Pathol Med* 33:162-9, 2004.
57. Tang HM, Torabinejad M, Kettering JD, Leakage evaluation of root end filling materials using endotoxin. *J Endod* 28:5-7, 2002.
58. Carratù P, Amato M, et al, Evaluation of leakage of bacteria and endotoxins in teeth treated endodontically by two different techniques. *J Endod* 28:272-5, 2002.
59. Williamson AE, Dawson DV, et al, Effect of root canal filling/sealer systems on apical endotoxin penetration: a coronal leakage evaluation. *J Endod* 31:599-604, 2005.
60. Gulabivala K, Sayed AA, Wilson M, The effect of retrograde cavity design on microleakage of amalgam fillings. *Int Endod J* 28:204-12, 1995.

TO REQUEST A PRINTED COPY OF THIS ARTICLE, PLEASE CONTACT Zahed Mohammadi, DMD, MSD, at mohammadi_zahed@yahoo.com.

Protecting dentists. It's all we do.

tdic®

We produced two of the nation's premier dental conventions. *CDA Presents The Art and Science of Dentistry* is where more than 32,000 dental professionals learn about the industry's latest clinical and technological advancements, hear from top-tier speakers, connect with like minds, and have an opportunity to gain 50 C.E. credits a year.

We protected nearly 18,000 dentists nationwide. Thirty years ago, in a climate of skyrocketing premiums, a brave group of CDA dentists decided it was time to intercede and created The Dentists Insurance Company. Today, three out of four CDA members choose TDIC for their Professional Liability insurance.

Education Protection

We added more than 100 new resources to help you run your practice like a pro. In fact, from the Sample Employee Manual to the Dental Benefit Plan Handbook to blogs that feature feedback from your peers, **cdacompass.com** has helped nearly 9,000 members better manage the business side of their practices.

Support

Progress.

It's what happens when 25,000 dentists work together.

cda.org/renew

cda®

CDA JOURNAL, VOL 39, Nº3

Periodontal Plastic Interceptive Surgery for a Labially Impacted Maxillary Canine: A Case Report

NEERAJ AGRAWAL, BDS, MDS; KAVITA AGRAWAL, BDS, MDS; K. ROSAIAH, BDS, MDS; AND ANKUR CHAUKSE, BDS, MDS

ABSTRACT Management of an impacted canine often leads to an inadequate width of attached gingiva, which can be a possible risk for future gingival recession and associated complications. Uncovering a labially impacted maxillary canine can be performed by gingivectomy, apically positioned flap surgery, or a closed eruption technique. Choosing the right technique is sometimes confusing. The authors present a case that was managed by apically positioned flap surgery followed by orthodontic treatment.

AUTHORS

Neeraj Agrawal, BDS, MDS, is a senior lecturer, Department of Periodontics, People's Dental Academy, Bhopal, India.

Kavita Agrawal, BDS, MDS, is a senior lecturer, Department of Oral Medicine, Diagnosis and Radiology, People's College of Dental Sciences, Bhopal, India.

K. Rosaiah, BDS, MDS is a professor, Department of Periodontics, People's Dental Academy, Bhopal, India.

Ankur Chaukse, BDS, MDS, is a senior lecturer, Department of Orthodontics, People's Dental Academy, Bhopal, India.

After the third molars, the maxillary canines are the second-most commonly impacted permanent teeth with the incidence of 1 to 2.5 percent.[1] Management of impacted maxillary canines can be very complex and requires a carefully planned interdisciplinary approach. On the other hand, with the appropriately planned treatment, the eruption process can be simplified, resulting in a predictably stable and esthetic result. Various clinical signs of canine impaction are documented in the dental literature. They include delayed eruption of the permanent canine, over-retention of primary canine, absence of labial bulge, presence of a palatal bulge, and distal crown tipping of the lateral incisor.[2]

About one-third of impacted maxillary canines are positioned labially or within the alveolus, and two-thirds are located palatally.[3] There are three techniques for uncovering a labially impacted maxillary canine: gingivectomy, apically positioned flap surgery, and closed eruption technique.[4] When there is an inadequate width of the attached gingiva (WAG), the gingivectomy procedures may cause post-treatment soft-tissue recession. To preserve the WAG, an apically positioned flap technique should be used. This article describes the management of a labially impacted maxillary canine uncovered by apically positioned flap surgery followed by orthodontic treatment.

FIGURE 1. Intraoral view showing missing maxillary permanent canine with labial bulge.

FIGURE 2. Intraoral periapical X-ray showing mesioangular impacted canine and retained deciduous tooth.

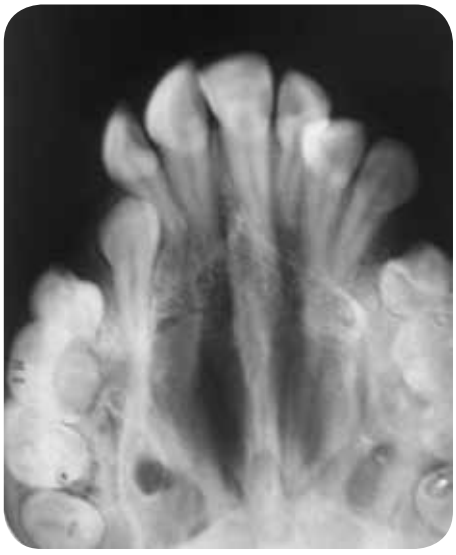


FIGURE 3. Occlusal X-ray showing position of impacted canine.

Case Report

A 16-year-old female was referred from the department of orthodontics for surgical exposure of the impacted right maxillary canine after the extraction of the retained deciduous right upper canine. On intraoral examination, it was found that the maxillary right permanent canine was unerupted and all permanent first premolars had been extracted for orthodontic correction (**FIGURE 1**). Intraoral periapical and occlusal radiographs (**FIGURES 2 AND 3**) showed a labially impacted right maxillary canine in a mesioangular direction. Considering the location and other factors, an open eruption technique was planned with apically positioned flap surgery. A treatment plan was explained to the guardian of the patient and consent was taken.

Medical contraindications for surgery were ruled out. One crestal incision to preserve the maximum width of attached gingiva, with two vertical incisions up to the vestibule were made and a full-thickness flap was elevated (**FIGURE 4**). On elevation of the flap, only the tip of the impacted canine crown was visible and the remainder of the crown was covered by a thin plate of bone (**FIGURE 4**). A round bur and a curette were used to remove a thin shell of bone up to the cementoenamel junction (**FIGURE 5**). The dental follicle was also removed with the help of a curette. With apical positioning of the flap, the area distal to the impacted canine would have healed by secondary intention, so a small piece of flap was cut horizontally from the elevated flap and sutured at the distal area of the exposed canine as a free gingival graft. The remainder of the flap was sutured to the periosteum in an apical position so that flap would retain its new position until healing, and, in spite of muscle pulling, the suture would not come out (**FIGURE 6**). Immediately after exposure, an orthodontic bracket was placed for retraction of the canine. Medication was prescribed to the patient. Ten days after surgery, the sutures were removed. Healing was uneventful and oral hygiene instructions were given again to the patient. The patient was referred back to the orthodontic department, where treatment was initiated after two weeks.

After six months of orthodontic treatment, there was 5 mm of facial-attached gingiva with an exposed, retracted, and well-aligned canine with no evidence of soft-tissue recession (**FIGURE 7**).

Discussion

Disturbances in the eruption of permanent maxillary canines are common because they develop deep within the maxilla and have the longest path to travel as well as development compared with any other tooth in the oral cavity. There are many documented etiological factors for impacted maxillary canines.[4] These etiological factors may be either localized or generalized. Generalized causes include systemic diseases, e.g. endocrinal abnormalities, febrile diseases, and radiation exposure. Localized causes for impaction are, 1) tooth size/arch length discrepancies, 2) prolong retention or early loss of primary canine, 3) abnormal position of the tooth bud, 4) the presence of an alveolar cleft, 5) cystic or neoplastic formation, 6) ankylosis, 7) dilacerations of the root, and 8) iatrogenic factors or any idiopathic conditions.[2] Failure of the primary canine roots to resorb creates a potential mechanical obstacle for the normal eruption of the permanent canine. This may be a possible causative factor for permanent canine impaction in this case.

Assessing the position of an impacted canine is the key to determining the feasibility of, and proper access for, a surgical procedure, as well as the best direction for the application of orthodontic forces. The most common radiological methods used in practice are the intraoral periapical radiograph (buccal object rule), and the occlusal radiograph.[3] Panoramic, posteroanterior, or lateral cephalometric radiographs are also helpful in making a correct diagnosis. Cone beam computed tomography can identify and locate the accurate

FIGURE 4. Reflection of flap with one crestal and two vertical incisions. Only the tip of the crown is visible, the rest of the crown is covered by bone.

FIGURE 5. Exposure of the crown up to the cementoenamel junction by careful removal of the thin shell of the bone.

FIGURE 6. Apical positioning and suturing of the flap to the periosteum with closure of the distal wound with free gingival graft.

FIGURE 7. Photographs after six months, showing retracted canine with preservation of 5 mm of attached gingiva..

TABLE 1

Various Methods of Surgical Exposure of Labially Impacted Maxillary Canine With Indications and Contraindications.[4]

	Open Eruption Technique		Closed Eruption Technique
	Gingivectomy	*Apically Positioned Flap*	
Labiolingual position	Tooth is labially placed, not covered by bone	Tooth is labially placed, and often thin shell of bone is present	Crown is deeper in alveolus
Vertical position	Canine cusp is coronal to mucogingival junction	Crown cusp is apical to mucogingival junction	Crown is significantly apical to mucogingival junction
Width of attached gingiva	Adequate (minimum 3 mm attached gingiva should be present after the procedure)	Inadequate (If attached gingiva is expected to be less than 3 mm, after gingivectomy)	
Mesiodistal position of the canine	Not recommended if canine crown is tilted mesially toward incisor	Only recommended technique if canine crown is tilted mesially toward incisor	Not recommended if canine crown is tilted mesially toward incisor

position of impacted canines but have limited use in routine practice because of the increased cost, time, radiation exposure, and associated medico-legal issues such as who may own and operate the machine, how broadly and narrowly should the field be collimated, etc.[5,6]

Kokich in 2004 reported three methods for uncovering a labially impacted maxillary canine: gingivectomy, creating an apically positioned flap, and using closed eruption techniques.[7] He also suggested four criteria for determining the correct techniques for surgically exposing a labial or intra-alveolar impaction of a maxillary canine. These are: 1) the labiolingual position of the impacted canine crown; 2) the vertical position of a tooth relative to the mucogingival junction; 3) the amount of attached gingiva in the area of impacted canine; and 4) the mesiodistal position of the canine crown (TABLE 1).

If there is insufficient gingiva (less than 3 mm following surgery) in the area of the canine, the gingivectomy technique cannot be used and the only technique that predictably would produce more attached gingiva is an apically positioned flap. If the crown is positioned mesially and over the root of the lateral incisor, it could be difficult to move the tooth through the alveolus unless it was completely exposed with an apically positioned flap. In this latter situation, closed eruption or excisional uncovering generally would not be recommended. Considering all of these criteria, an apically postnasal flap approach (APF) was planned for this case.

The main advantage of APF surgery is that the keratinized gingiva is preserved, leading to minimal postoperative complications.[8] Disadvantages can include formation of accessory frenum, which may cause orthodontic relapse; greater risk of recession with an uneven gingival margin; and considerable bone removal during the procedure.

Summary and Conclusion

Although interceptive periodontal plastic surgery is a successful procedure for providing long-term results, it is influenced by the degree of impaction and the patient's age during diagnosis. Early diagnosis of impaction and intervention is the best strategy. Williams suggested that extraction of the maxillary deciduous canine as early as 8 or 9 years of age will enhance the eruption and self-correction of a labial or intra-alveolar maxillary canine impaction.[9] However, the probability for eruption and self-correction decreases as the horizontal angulation increases.

Therefore, clinicians should intercede and extract the primary canine in a timely manner to prevent impaction of permanent canines. But once it is impacted, a careful multidisciplinary treatment plan is required as discussed above. ■■■■

REFERENCES

1. Bass TB, Observations on the misplaced upper canine tooth. *Dent Pract Dent Rec* 18:25-33, 1967.
2. Bishara SE, Impacted maxillary canines: a review. *Am J Orthod Dentofacial Orthop* 101:159-71, 1992.
3. Johnston WD, Treatment of palatally impacted canine teeth. *Am J Orthod* 56:589-96, 1969.
4. Bedoya MM, Park JH, A review of the diagnosis and management of impacted maxillary canines. *J Am Dent Assoc* 140(12):1485-93, 2009.
5. Elefteriadis JN, Athanasiou AE, Evaluation of impacted canines by means of computerized tomography. *Int J Adult Orthodon Orthognath Surg* 11(3):418-23, 1996.
6. Friedland B, Medicolegal issues related to cone beam CT. *Semin Orthod* 15: 77-84, 2009.
7. Kokich VG, Surgical and orthodontic management of impacted maxillary canines. *Am J Orth Dent Orthop* 126(3):278-83, 2004.
8. Vermette ME, Kokich VG, Kennedy DB, Uncovering labially impacted teeth: apically positioned flap and closed eruption techniques. *Angle Orthodont* 65(1):23-32, 1995.
9. Williams B, Diagnosis and prevention of maxillary cuspid impaction. *Angle Orthod* 51:30-40, 1981.

TO REQUEST A PRINTED COPY OF THIS ARTICLE, PLEASE CONTACT
Neeraj Agrawal, BDS, MDS, at dna7kgmc@gmail.com.

CDA JOURNAL, VOL 39, Nº3

Management of Dentinal Hypersensitivity: A Review

ABHISHEK PAROLIA, MDS; M. KUNDABALA, MDS; AND MANDAKINI MOHAN, MDS

ABSTRACT Dentinal hypersensitivity is a very common clinical finding that can cause considerable concern for the patient. Clinicians must understand the various etiological factors, their complexities, and numerous treatment options available. This article reviews the etiology, management, and prevention of dentinal hypersensitivity.

AUTHORS

Abhishek Parolia, MDS, is an assistant professor, Department of Conservative Dentistry and Endodontics, Manipal College of Dental Sciences, Mangalore, Manipal University, India.

M. Kundabala, MDS, is a professor and head, Department of Conservative Dentistry and Endodontics, Manipal College of Dental Sciences, Mangalore, Manipal University, India.

Mandakini Mohan, MDS, is an assistant professor, Department of Prosthodontics, Manipal College of Dental Sciences, Mangalore, Manipal University, India.

Dentin hypersensitivity has been referred in the past by various terminologies such as dentin sensitivity, cervical dentin sensitivity and dentinal hypersensitivity. Dentin hypersensitivity (DH) is characterized by short, sharp pain arising from exposed dentin, in response to stimuli typically thermal, evaporative, chemical, tactile, or osmotic that cannot be ascribed to any other form of dental defect or disease.[1] The prevalence appears to be fairly similar in different parts of the world, although there are some regional differences. The reported prevalence of dentine hypersensitivity varies from 4 to 57 percent.[2-3]

Dentin hypersensitivity often occurs in patients who are between 30 and 40 years old but it may affect the patients of any age.[4] It affects women more often than men, though the gender difference rarely is statistically significant. This condition may affect any tooth, but it most often affects canines and first premolars because they are prominent in the arch.[4] Orchadson found the frequency of dentinal hypersensitivity 38 percent in premolars, 26 percent in incisors, 24 percent in canines and 12 percent in molars.[5] Dentinal hypersensitivity may present on any surface, which includes cuspal or incisal edges, and on lingual or palatal surfaces, but often it occurs on the buccal cervical margins (82 percent), proximal surface (10 percent) and lingual surfaces (8 percent).

Neuroanatomy of Pulp Dentin Complex

The sensory system of the pulp appears to be well-suited for signaling potential damage to the tooth. The pulp is richly innervated and contains both A (myelinated) and C (unmyelinated) nerve fibers. Most of the nerve fibers enter the tooth through the apical foramen or foramina, although a small number may enter through accessory canals. The nerves of the pulp include primary afferent fibers that are involved in pain transmission as well as sympathetic efferent fibers that modulate the microcirculation of the pulp.

These latter fibers originate in the su-

CDA JOURNAL, VOL 39, Nº3

TABLE 1

Nerve Fibers According to Their Diameter, Conduction Velocity, and Function

Nerve	Diameter (in micrometer)	Conduction Velocity (m/s)	Primary Function
A-alpha	12-20	70-120	Proprioception
A-beta	5-12	30-70	Transmission of touch and pressure
A-gamma	3-6	15-30	Motor function to spinal nerves
A-delta	2-5	12-30	Transmission of pain, temperature and touch
B	1-3	3-15	Preganglionic autonomic function
C	0.2-2	0.5-2	Postganglionic sympathetic pain and possibly heat, cold and pressure

perior cervical ganglion and when stimulated, cause smooth muscle cells encircling arterioles and precapillary sphincters to contract, thus reducing the flow of blood through the pulp. Most of the myelinated fibers of the pulp have diameters ranging from 1 to 4 micrometers. The rate at which these fibers conduct impulses (conduction velocity) varies from 4 to 30 meters per second, depending upon their size (large fibers conduct impulses faster than small fibers). Thus, these fibers fall into the range of A-delta fibers. However, a few larger fibers having conduction velocities as high as 48 meters per second have been reported. These are classified as A-beta fibers. In the pulp, the function of these larger fibers has yet to be elucidated. In the case of unmyelinated nerves, the individual axons are usually less than 1 micron in diameter, and their conduction velocity ranges from 0.5 to 2 meters per second.

Distribution of Neural Elements

Most of the nerve fibers entering the apical foramen are grouped together in parallel bundles in the central region of the pulp. This connective tissue supports the nerve fibers and blood vessels that together form a neurovascular bundle. Not all nerve fibers entering the pulp are grouped in neurovascular bundles, as some nerves and vessels lay independent of each other. While most nerves are located in the central region of the pulp, some unmyelinated fibers are situated toward the peripheral region.

After entering the apical foramen the nerves pass upward in the radicular pulp with very little branching. Nerve axons located in the center of the radicular pulp do not branch until reaching the cervical or coronal pulp. Nerve terminals in the root are probably derived from small nerve bundles located in the peripheral pulp. As they pass into the coronal pulp, nerves fan out and branch into smaller nerve bundles. As they approach the peripheral pulp, individual "A fibers" within small nerve bundles lose their myelin sheath.

These fibers divide repeatedly and give off collaterals that form an extensive interlacing network of nerve fibers known as the subodontoblastic plexus, or plexus of Raschkow. From this plexus, fibers extend toward the dentin. Some of these fibers form an end arborization of delicate terminal fibers that wind vertically through the odontoblast layer and end in small knob-like thickening on the surface of odontoblasts. Other fibers loop back toward the pulp. Characteristically, these terminal branches show expansions and constrictions that give them a characteristic beaded appearance.

Nerve Endings

No encapsulated receptors are known to exist in the pulp. Nonencapsulated receptors, or free nerve endings, are found in dental pulp. Both pain and touch sensations have been ascribed to free nerve endings. However, stimulation of nerve endings in the pulp gives rise only to pain. The distribution of nerve terminals arising from the subodontoblastic plexus in human teeth was studied and classified in four types of nerve endings according to where they terminated[6]:

1. Marginal fibers do not reach as far as the predentin and terminate as partially naked axons in the extracellular spaces of the cell-rich zone, the cell-free zone, or the odontoblast layer. These fibers were consistently found throughout the peripheral pulp.

2. Simple predentinal fibers extend to the odontoblast-predentin border or enter the predentin. Some of these fibers run straight or spiraled through a dentinal tubule along with an odontoblast process; others run diagonally along the odontoblast-predentin border or within the predentin. Still others looped back toward the odontoblast layer.

3. Complex predentinal fibers arborize profusely within the predentin. The area innervated by one of these fibers often reached thousands of square micrometers. These fibers were most often seen along the lateral wall of the pulp chamber, especially near the cervix.

4. Dentinal fibers pass through the predentin without branching and enter the dentin through dentinal tubules.

Functional Characteristics of Sensory Nerve Fibers of the Pulp

Nerve fibers are classified according to their conduction velocity and axon diameter and functions (TABLE 1).

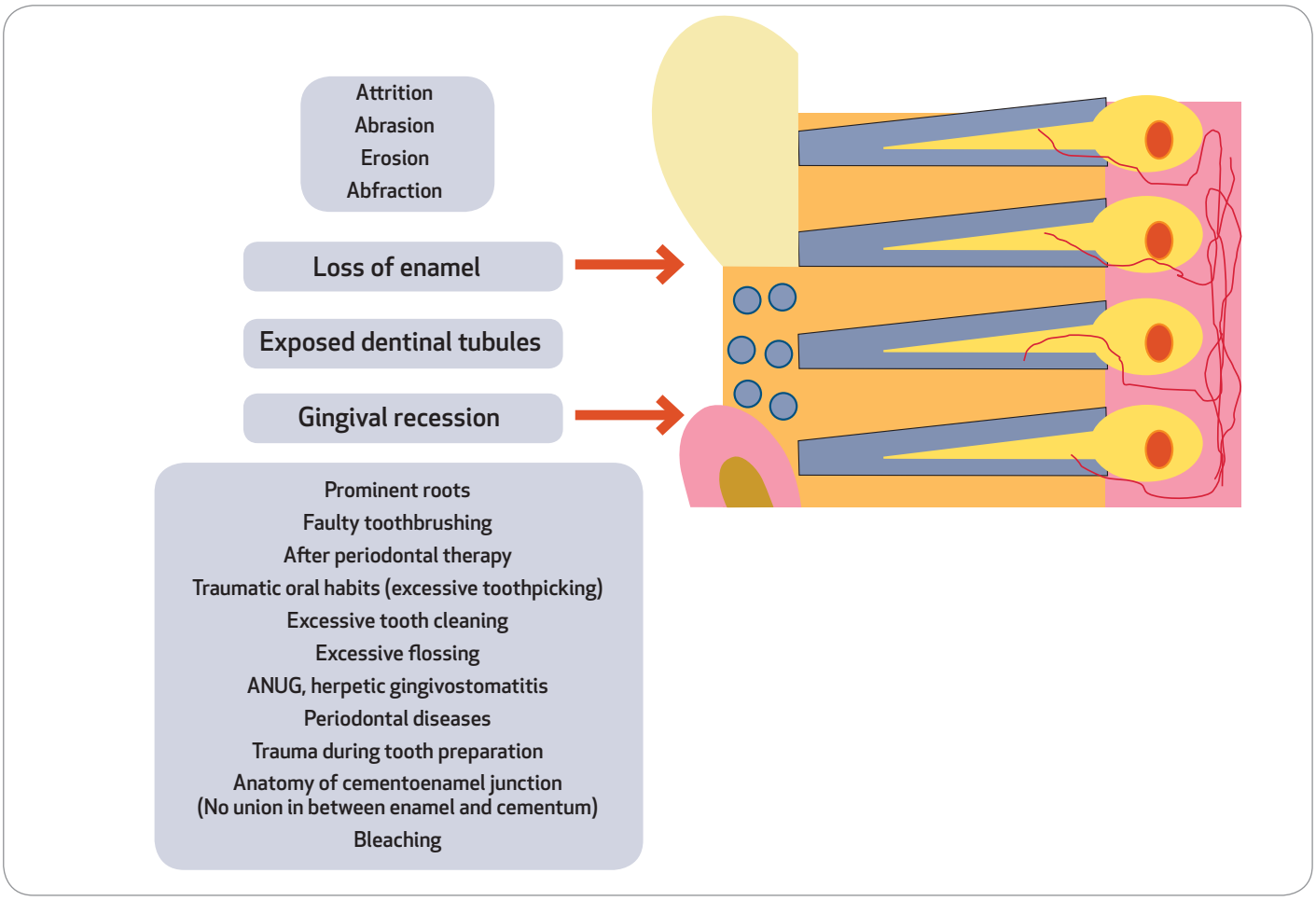


FIGURE 1. Etiology and predisposing factors for dentinal hypersensitivity.

Theories of Dentine Sensitivity

Odontoblastic Transduction Theory

According to this theory, odontoblastic processes are exposed on dentinal surface and can be excited by a variety of chemical and mechanical stimuli. As a result of such stimulation, neurotransmitters are released and impulses are transmitted toward the nerve endings. To date, no neurotransmitters have been found to be produced or released by odontoblastic process.

Neural Theory

This concept advocates that thermal or mechanical stimuli directly affect nerve endings within the dentinal tubule through direct communication with pulpal nerve fibers. While this theory has been supported by the observation of the presence of unmyelinated nerve fibers in the outer layer of root dentin and the presence of neurogenic peptides, it is still considered theoretical with little evidence to support it.[7]

Hydrodynamic Theory

The most accepted theory put forth by Brannstrom and Astrom proposes that the stimuli (temperature, physical, or osmotic changes) cause a displacement of the fluid that exists within the dentinal tubules (either in the inward or the outward direction) and this mechanical disturbance activates the nerve endings.[8] They reasoned that this fluid movement through dentin excited mechanoreceptors nerves near the pulp. A corollary to this theory is that anything that interferes with fluid movement through dentinal tubules, or which lowers nerve excitability, would decrease dentin sensitivity. In general, the excitement of nerve fibers by different stimuli can be explained by the hydrodynamic theory.

Alternative Mechanism (Modified Hydrodynamic Theory)

Several investigators have used a neurophysiological model to evaluate dentin hypersensitivity. The results from these studies suggest that the application of various chemical solutions in particular potassium-

CDA JOURNAL, VOL 39, Nº3

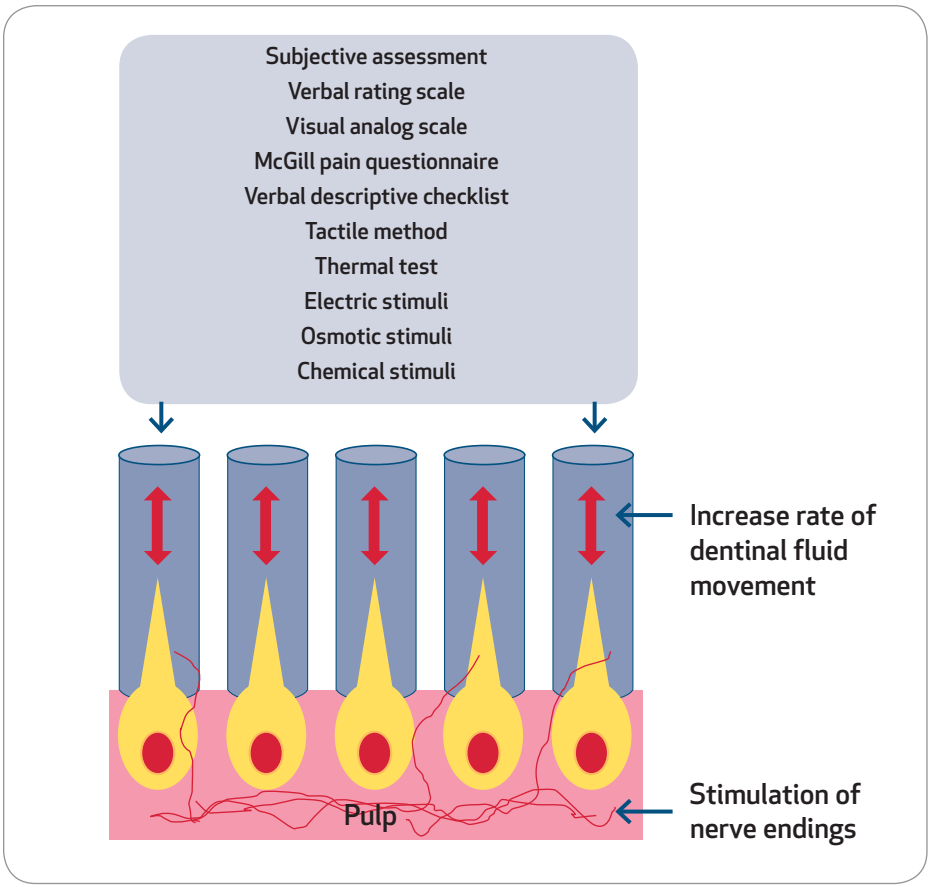


FIGURE 2. Etiology and predisposing factors for dentinal hypersensitivity.

containing compounds to dentin resulted in raising the intratubular potassium content that in turn rendered the interdental nerves less excitable to further stimuli by depolarizing the nerves fibers of the membrane.

Based on these studies, Kim proposed an alternative mechanism namely depolarization of the dentin by blocking nerve activity (direct ionic diffusion).[9] This hypothesis was, however, criticized by Sena who showed that Kim's experiment was based on deep-cut cavity preparations with only a very thin slice of dentin between the exposed dentin surface and the pulp.[10] In consequence, potassium ions would have to overcome the opposing pulpal pressure that produces an outward flow of dentinal fluid. Such an outward flow can prevent the inward diffusion of substances from the oral cavity. While the alternative or modified hypothesis of stimulus transmission across dentin appears to be an attractive alternative to the hydrodynamic theory, this hypothesis requires further investigation.

Etiology and Predisposing Factors of Dentinal Hypersensitivity

By virtue of its relation with the pulp, dentine is naturally sensitive, but for this sensitivity to manifest clinically, the dentine must be exposed which can influence its sensitivity. Dentine freshly exposed by cutting or root planing may not be particularly sensitive because of the presence of a smear layer.[11] In hypersensitive dentine, the smear layer is generally absent and the tubules are patent. Two processes need to occur for dentine hypersensitivity to arise: the dentine has to become exposed and the dentine tubule system has to be opened and be patent to the pulp. Dentin, which is sealed peripherally by enamel or cementum, is not sensitive to osmotic or tactile stimuli. However, the degree of thermal sensitivity increases when dentin becomes exposed. Exposure of dentine may occur by loss of either enamel or periodontal tissues, the latter of which is often termed gingival recession[11-13] (**FIGURE 1**).

Bleaching as a Cause[14]

Dental bleaching has been reported to cause a number of side effects, including tooth sensitivity, gingival irritation, tooth pain, tingling of the tissues, and a sore throat. Tooth sensitivity and gingival irritation are the most frequently reported complaints. The hypersensitivity that occurs in association with bleaching has been attributed to patient factors, length of exposure to the bleaching agent, the concentration of the bleaching agent, pH of the whitening solution, and tray factors. Patients, especially those who already have exposed dentin or already have some type of hypersensitivity or those with larger pulps, should be warned that they may have a greater risk of hypersensitivity secondary to bleaching.

Measurement of Dentinal Pain

Most methods for studying dentinal sensitivity use thermal, mechanical, osmotic, evaporative or electrical stimuli, all of which can elicit dental pain. However, not all of these are equally suitable or sufficiently quantifiable for use in clinical assessments. Ideally, the stimuli chosen for evaluation ought to be measurable and reproducible, but should also be clinically relevant and take account of the pain experience of the individual (**FIGURE 2**).

The requirements of methods used to evaluate sensitivity are:

- It should be quantifiable and reproducible;
- It should elicit dentinal pain rather than pulpal pain; and

■ When more than one stimulus is used there should not be any interference with each other.

In practice, dentine sensitivity can be measured either as pain thresholds to graded stimuli or by using one of the various forms of subjective rating scales. Traditionally, dentin hypersensitivity has been evaluated mainly subjectively on the basis of the individual patient's subjective response, for example, in the form of verbal rating and visual analogue scales. Furthermore, the subjective nature of the response and variability in patient ability to express a given response may also complicate the assessment. Currently, no single method of eliciting and assessing dentin hypersensitivity may be considered ideal.

Tactile Method

Different methods of applying tactile stimuli include scratching the dentin surface with a sharp probe, scaling procedures, mechanical pressure stimulators, and, more recently, the Yeaple probe has been used. The simplest tactile method used to test for hypersensitivity is to lightly pass a sharp explorer over the sensitive area of a tooth cementoenamel junction and to grade the response of the patient on a severity scale of 0-3.

0: No pain felt
1: Slight pain or discomfort
2: Severe pain
3: Severe pain that lasts

Another tactile method is a hand-held scratch device developed by Kleinberg that consists of torsion gauge and a sharp explorer-like probe that can be passed easily across a sensitive tooth.[15] It has an indicator that is displaced by the arm of an explorer tine that records the force of displacement in centi-Newton. A tooth that fails to respond to a force of 80 centi-Newtons is classified as nonsensitive.

Drawbacks of Tactile Method

■ Testing and measuring tactile sensitivity levels are dependent on the patience and expertise of the investigator. The person should develop a feel for applying tactile pressure to exposed dentin areas regardless of the device.

■ Care must be exercised that the force is applied gradually and the force should not go beyond the point at which the subject actually perceives sensitivity.

■ The total area of exposed dentin site may not be sensitive. Only specific spots may have to be swept in the suspected area until the sensitive spot is found.

THE TACTILE STIMULI are usually applied before the thermal stimuli if the two are used in the same subject.

Thermal Test

A simple thermal method for testing is directing a burst of air at room temperature from a dental syringe onto the test tooth. Generally, room air is cooler than teeth, and cooling by this means is easily detected as pain if the tooth is sensitive. Air stimulation has been standardized in a number of studies as a one-second blast from the air syringe of a dental unit, where its temperature is set generally between 65- and 70-degrees Fahrenheit and a pressure of 60 psi. The air is directed at right angles to test surface with adjacent teeth usually isolated by operator's fingers. Response is assessed from 0-3.

Thrash, Deumen, and Smith used a miniature thermistor that is connected to a multichannel recorder and found that the temperature would be easily measured.[16] The apparatus consists of a miniature thermistor connected to a medical multichannel recorder with a hand-held device to register pain. When agents affecting tooth sensitivity are assessed by this method, improvements are measured in centigrade and are expressed as percentage improvements. The tactile stimuli are usually applied before the thermal stimuli if the two are used in the same subject, since some time is required for the test tooth to return to baseline and some adaptation to incremental temperature changes may take place.

Thermal stimuli are effective hydrodynamic stimuli because of the differences in the thermal conductivity and coefficients of expansion or contraction of pulpal/dentinal fluids and their containers: enamel and dentin. Application of cold causes a more rapid volumetric contraction of dentinal fluid than occurs in dentin. This mismatch of volumetric changes produces negative intrapulpal pressure that displaces mechano-reception and causes pain.

Electrical Stimuli

The use of electrical stimuli to quantitate the degree of dentin hypersensitivity has been criticized on several grounds as being nonphysiologic. It only evaluates the presence or absence of nerve vitality rather than degree of sensitivity. Electrical stimuli differ from most other dentinal stimuli in that they bypass the normal receptor mechanisms and excite nerves directly in the pulp.

Osmotic Stimuli

Osmotic stimuli is done by preparing fresh, saturated solution of sucrose and allowing it to reach room temperature. The solution is applied to root surfaces after isolation and retained in place for 10 seconds or until discomfort is per-

CDA JOURNAL, VOL 39, Nº3

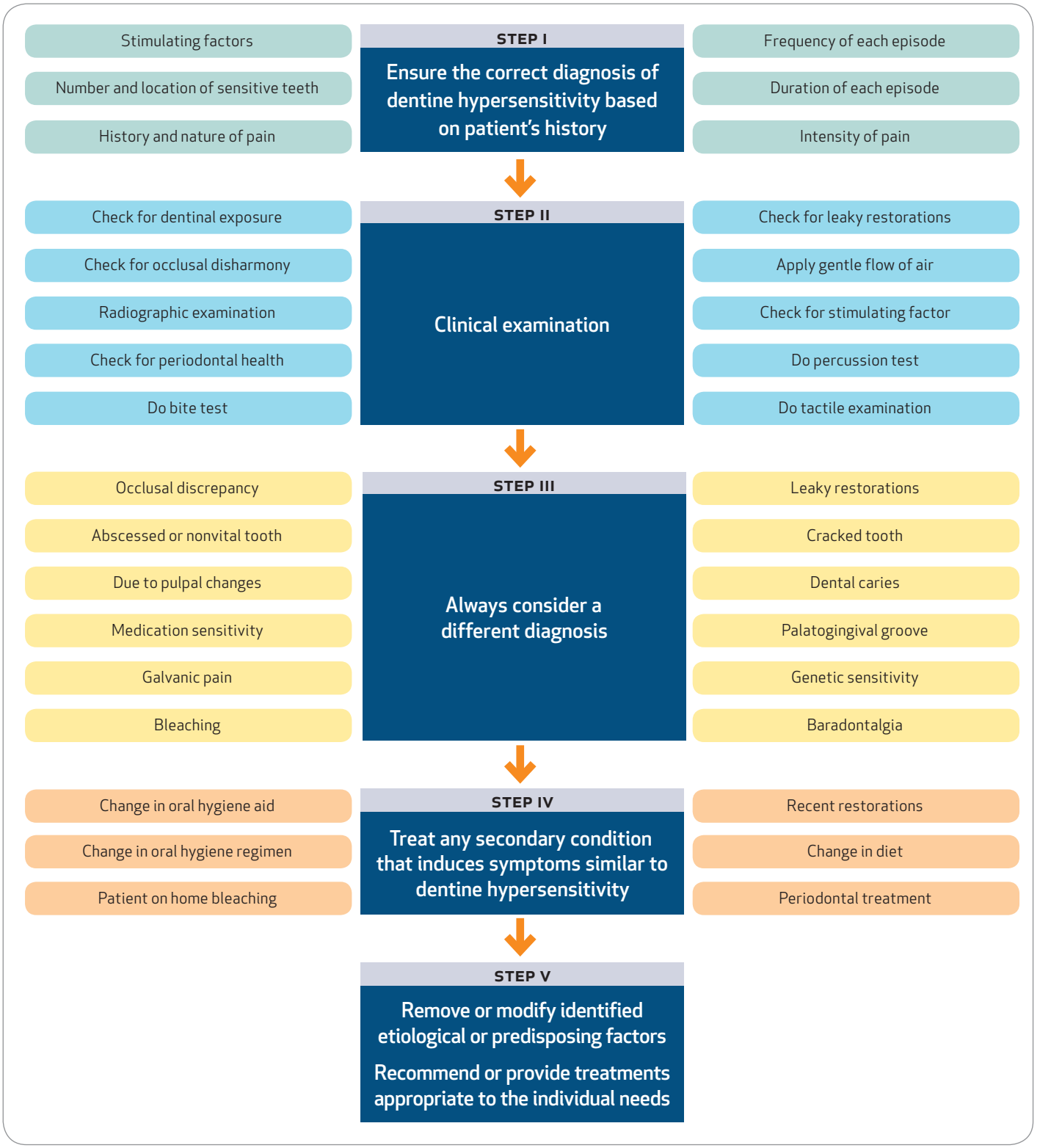


FIGURE 3. Dianosis and management of dentinal hypersensitivity.

ceived. The sensation is rated as pain or no pain, which then is correlated to reading 1 or 0. The osmotic challenge is stopped by rinsing with warm water.[17]

Chemical Stimuli

Chemical stimuli, for example, sodium chloride, glucose, sucrose, and calcium chloride have been used to elicit dentin hypersensitivity. The stimulus is not conducive to threshold measurement because repeated application of chemical stimulus reduces sensitivity of exposed dentin. Problems such as inconvenience or difficulty in administering and controlling the stimulus and possible injury to the adjacent soft tissues are the drawbacks of the chemical stimulus to be used as a practical method of assessment of hypersensitivity in chemical studies.[15]

Subjective Assessment

The subject's quantitative assessment of their own overall perception of hypersensitivity pain has been used in clinical studies. Patients were asked to rate their own perception of overall sensitivity to hot/cold food and drink, air, toothbrushing and sweet and sour food as experienced during everyday routine. They reported using either verbal rating scale or visual analogue scale.

Verbal Rating Scale (VRS)

The typical VRS to assess pain may look like the following:

0: No pain felt
1: Slight pain or discomfort
2: Severe pain
3: Severe pain that lasts

Drawbacks

- The VRS offers a restrictive choice of words that may not represent the pain experience with significant precision in all the patients.
- The mathematical interpretation of the scoring system is also challenging, in that the scores are then analyzed as these numbers reflected true quantitative differences in pain, rather than simple qualitative differences.

Visual Analogue Scale (VAS)

A visual analogue scale is a line usually 10 cm in length, the extremes of the line representing the limits of pain a subject might experience during a dentin hypersensitivity episode. One end could be labeled "no discomfort" or "no pain" whereas the other end could be labeled "severe discomfort" or "severe pain." Patients are asked to place a mark on a 10 cm line that indicates the intensity of their current level of sensitivity or discomfort following application of the test stimuli. When VAS is properly explained to subjects, they can easily understand its use and successfully use it to indicate their level of pain response to hypersensitive stimuli. The VAS is a more appropriate device than VRS for measuring levels of sensitivity pain during subject assessment and for measuring tactile and thermal stimuli of hypersensitivity.

McGill Pain Questionnaire

It is used to evaluate a variety of painful dental conditions including dentine sensitivity. The patient is shown 20 sets of words and then asked to select a word from each set which best describes present pain experience. Each set contains up to six words in descending order of severity.

Verbal Descriptor Checklist

A verbal descriptor checklist allows quantitative assessment of both the sensory and affective dimensions of pain using a continuum across different pain condition instead of words intended to distinguish conditions.

Management of Dentinal Hypersensitivity

There are various treatment options available to manage dentinal hypersensitivity. Thorough diagnosis and proper treatment planning are the essential keys to treat dentinal hypersensitivity (**FIGURE 3**).

Requirements for an ideal therapy:

- Relatively painless on application
- Easily applied
- Rapid in its action
- Permanently effective
- Not discolor tooth structure
- Be cost effective

Prevention of Dentine Hypersensitivity

Suggestions for Patients

- Maintain good oral hygiene.
- Avoid using large amounts of dentifrice.
- Avoid hard-bristled toothbrushes without end-rounded bristles.
- Avoid brushing teeth immediately following ingestion of acidic food or beverages.
- Avoid overbrushing with excessive pressure for prolonged periods of time.
- Avoid excessive flossing or incorrect use of other interproximal cleaning devices.
- Avoid "pecking" at the gums or using toothpicks inappropriately.

Suggestions for Professionals

- Avoid overinstrumentation of root surfaces during calculus removal and scaling and root planing.
- Avoid overpolishing the exposed roots during stain removal.
- Avoid violating the biologic width when placing crown margins causing subsequent recession.
- Avoid "burning" the gingival tissue during in-office tooth whitening or bleaching procedures.

CDA JOURNAL, VOL 39, Nº3

TABLE 2

Types of Desensitizing Agents Based on Their Mode of Action

Mode of Action	Agents
Anti-inflammatory	Corticosteroids
Nerve desensitization	Potassium nitrate
Protein precipitants	Formaldehyde Glutarldehyde Silver nitrate (28% ammonical silver nitrate) Zinc chloride Strontium chloride
Tubule occluding agents	Calcium hydroxide Dibasic calcium phosphate Ferric oxalates (6%) Dipotassium oxalate (30%) Monohydrogen-monopotassium oxalate (3%) Sodium fluorides (2%) Stannous fluoride (4%) Sodium monofluorophosphate (0.76%) Strontium chloride
Tubule sealants	Varnish Dental resin and adhesives Glass ionomer cements
Miscellaneous	LASER Soft-tissue grafts Propolis Acupuncture and hypnosis

Potential Treatment Modalities for Dentine Hypersensitivity

Nature's Way of Desensitizing Hypersensitive Dentin

- Formation of reparative dentin that seals the dentinal tubule to an extent
- Deposition of mineral tubules during formation of sclerotic dentin that obliterates the lumen
- Salt present in saliva also helps in occlusion of dentinal tubule
- Acquired pellicle and calculus formation also participate in natural desensitization

Desensitizing agents: There are various types of desensitizing agents available, which can be classified according to their mode of action (TABLE 2).

Other classifications:

- Home used desensitizing agents
- In-office treatment agents

At-Home Treatments

A wide range of commercial products is available for self-treatment. The products include agents such as potassium salts, strontium salts, and fluoride salts in toothpaste, mouthwash, and gel formulations.

Desensitizing Toothpastes/Dentifrices

Toothpastes are the most widely used dentifrices for delivering over-the-counter desensitizing agents (TABLE 3). The first desensitizing toothpastes to appear on the market claimed either to occlude dentinal tubules (those that contained strontium salts and fluorides) or destroy vital elements within the tubules (those that contained formaldehyde). Now, most desensitizing toothpastes contain a potassium salt such as potassium nitrate, potassium chloride, or potassium citrate. A study reported that a remineralizing toothpaste containing sodium fluoride and calcium phosphates helps in the reduction of dentinal hypersensitivity.[18]

Strontium Salts

Dentifrices containing 10 percent strontium chloride hexahydrate as the desensitizing agent have been widely available for three decades. Zappa examined the effect of toothpastes containing strontium salts, either as the chloride or the acetate, on patients with dentine hypersensitivity and found it to be very effective in reducing dentinal hypersensitivity.[19] It acts as a protein precipitant and tubule occluding agent. Strontium penetrates into the dentinal depth of 20 micrometer and extends into the dentinal tubule. Strontium deposits are produced by an exchange with calcium in the dentin resulting in recrystalization in the form of strontium apatite complex.

Potassium Salts

Potassium salts are now the most commonly used agents incorporated into toothpastes and mouthwashes for the self-applied treatment of dentine hypersensitivity. On an overall basis, the clinical evidence supports the efficacy of 5 percent potassium nitrate dentifrice for the alleviation for the pain of tooth hypersensitivity. Studies on toothpastes reported by a number of authors demonstrated a significant benefit for the tooth paste containing a potassium salt compared with the control toothpaste.[20-26]

Proposed Mechanism of Action

- *Alteration of nerve potential.* Potassium ions are thought to diffuse along dentinal tubules and decrease the excitability of intradental nerves by altering their membrane potential. Potassium ions into the pulp prevent repolarization of nerves after initial depolarization. This depolar-

TABLE 3

Commercially Available Desensitizing Toothpastes With Their Composition

Trade Names of Desensitizing Toothpaste	Composition
Sensodyne F	a) Potassium nitrate 5% w/w b) Sodium monofluorophosphate 0.8% w/w
Sensodyne	Strontium chloride hexahydrate 10% w/w
Senquel F	a) Potassium nitrate BP 5% w/w b) Sodium monofluorophosphate 0.7% w/w
Sensodent K	5% Potassium nitrate
Nitra Gel	a) Potassium nitrate BP 5% w/w b) Sodium monofluorophosphate 0.6% w/w
Thermoseal	Strontium chloride hexahydrate 10% w/w
Colgate sensitive	a) Potassium nitrate BP 5% w/w b) Sodium fluoride BP 0.22% w/w
Sensoform	Strontium chloride 10% w /w
Senquel	Potassium nitrate
Thermoseal RA (Rapid Action)	a) Potassium nitrate BP 5% w/w b) Sodium monofluorophosphate 0.7% w/w
Sensodent KF	a) Potassium nitrate BP 5% w/w b) Sodium monofluorophosphate 0.7% w/w

ized state decreases pain perception.[27,28]

- *Protein precipitation.* Potassium brings about precipitation of protein within the dentinal tubules.
- *Tubule occlusion.* Potassium ions block dentinal tubules by the formation of potassium precipitates.

There have been various formulations tried with potassium salts to get synergistic effects. A product containing 5 percent potassium nitrate and 0.454 percent stannous fluoride in a silica base produced significantly greater reduction in dentinal hypersensitivity than a toothpaste containing 5 percent potassium nitrate and 0.243 percent sodium fluoride in a silica base, or than an alternative formulation containing 5 percent potassium nitrate and 0.76 percent sodium monofluorophosphate in a dicalcium phosphate base.[23]

In-Office Treatments

Dental professionals can deliver a wider range of more complex and more potent desensitizing treatment.

Anti-inflammatory Agents

Corticosteroids

Corticosteroids have been used topically for their anti-inflammatory effects, but are not particularly effective. Lawson and Huff found that paramethasone had a significant desensitizing action.[29] Steroid application on dentin increases peri-tubular dentin mineralization thereby decreasing the diameter of dentinal tubule and reduces tubule fluid movement, but the exact mechanism is not known and the validity of steroid application has been questioned.[30]

Protein Precipitants

Formaldehyde and Glutaraldehyde

These agents precipitate salivary proteins in dentinal tubules and helps in reducing dentinal sensitivity. However, this effect has been questioned since various formulations have been found to have little or no effect on dentinal hypersensitivity.[31]

Silver Nitrate

Twenty-eight percent ammonical silver nitrate causes protein precipitation within the tubules to decrease hypersensitivity. But the use of silver nitrate may turn the tooth surface black and potentially harm the pulp and gingival tissues.

Zinc Chloride

Gottlieb developed the zinc chloride potassium ferrocyanide impregnation method for desensitizing root surfaces and cavities.[32] In this procedure, a 40 percent solution of aqueous zinc chloride was rubbed into the surfaces of sensitive teeth and allowed to remain for one minute. Subsequently, a 20 percent aqueous solution of potassium ferro cyanide was vigorously rubbed onto the dentin surface until an orange, curdy precipitate formed. Scanning the electron micrograph of this precipitate revealed a highly crystalline deposit covering the dentin surface. As most of the crystals were too large to enter the tubules, it is doubtful whether this method would provide a more efficient means of desensitizing dentin than burnishing alone.

Tubule Occluding Agents

Burnishing of Dentin

The burnishing of dentin with a toothpick or orangewood stick results in the formation of a smear layer that partially occludes the dentinal tubules. The burnishing of glycerin and sodium fluoride with an orangewood stick helps in the reduction of dentinal hypersensitivity.

Calcium Compounds

Calcium Hydroxide

Calcium hydroxide can be used to treat hypersensitive dentine. The exact mechanism of action is unknown but evidence suggests that it may block dentinal tubules

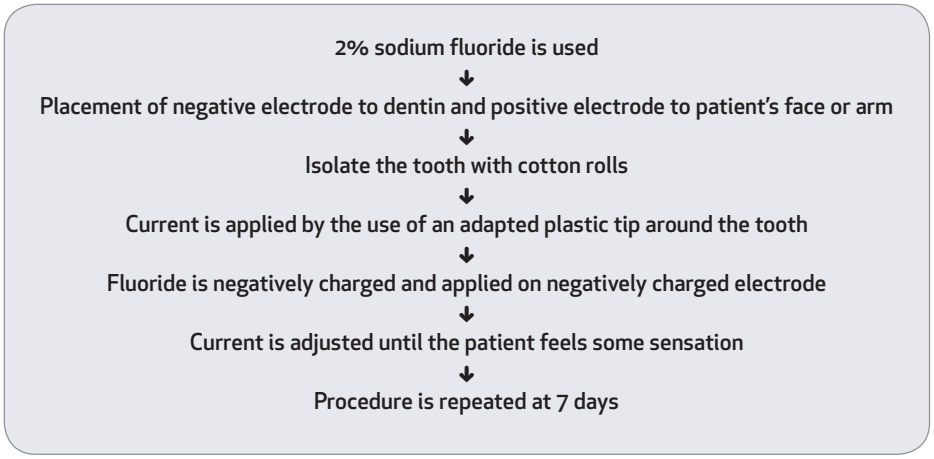


FIGURE 4. Procedure of fluoride iontophoresis.

or promote peritubular dentin formation. Calcium hydroxide might be capable of suppressing nerve activity because of an increase in the concentration of calcium ions around nerve fibers, which can result in decreased nerve excitability.[33]

Disadvantages

- One of the disadvantages is the action is not very prolonged and excess calcium hydroxide may irritate gingival tissue.

Oxalates

Oxalate-containing products are a popular agent for treating dentinal hypersensitivity. Ferric oxalates and potassium oxalates along with calcium ions in the dentinal fluid form insoluble calcium oxalate and occlude dentinal tubules.[34]

ADVANTAGES

- Easy to apply
- Inexpensive
- Well-tolerated by the patients

DISADVANTAGE

- Ferric oxalate forms black precipitate so it has been replaced by aluminum oxalate.

Fluoride Compounds

Lukomsky was the first to propose sodium fluoride as a desensitizing agent.[35]

Sodium fluoride blocks dentinal tubules by fluoride precipitation.[36]

Stannous fluoride causes calcific barrier on dentinal tubules.

Sodium monofluorophosphate interacts with hydroxyapatite crystals and forms a barrier on dentinal tubules.

Fluoride Iontophoresis

Iontophoresis is the use of an electrical potential to transfer ions into the body for therapeutic purposes. The main objective of fluoride iontophoresis is to drive fluoride ions deep into dentinal tubules[37] (**FIGURE 4**).

Iontophoresis Requires

- A charged drug be delivered through the electrode of the same polarity;
- The condition or disease under treatment be delivered at the electrode of the same polarity;
- The condition or disease under treatment be at or near the surface; and
- A modern, sophisticated source of direct current, with appropriate means of application, be used.

Hypothesis to Explain the Mechanism of Iontophoresis

- Induction of secondary dentin formation
- Induction of paresthesia on odontoblastic process or alteration of sensory mechanism of pain conduction
- Tubule occlusion by fluoride crystals

DISADVANTAGES

- Expensive
- Difficult to use
- Time consuming
- Operator sensitive

Tubule Sealants

Cavity Varnish

Dentin becomes insensitive when open tubules are covered with a thin film of varnish. The use of 5 percent sodium fluoride (NaF) in a thick varnish as a dentine desensitizer has been reported to be an effective means of providing temporary relief. The varnish does temporarily occlude dentinal tubules but the material is readily lost over time.[38,39]

Adhesive Resin Primers

The use of adhesive resin primer products has been shown to decrease dentine permeability for many years.[40,41] The treated surface becomes covered with a layer of polymer about 5-10 µm thick and some primitive resin tags are formed within open tubules. The long-term effectiveness of this resin product may be limited by the inability of the resin tags to bond to the walls of the peritubular dentine matrix lining most dentinal tubules.

Glass Ionomer Cements

One of the first clinical evaluations of the use of glass ionomers for the treatment of hypersensitive dentine in cervical abrasion lesions was reported by Low in 1981 and reported complete loss of hypersensitivity in 89.7 percent of all patients.[42]

Recent Advances

Laser

A rationale for laser-induced reduction in dentinal hypersensitivity is based on two possible mechanisms. The first mechanism implies the direct effect of laser irradiation on the electric activity of nerve fibers within the dental pulp, whereas the second involves modification of the tubular structure of the dentin by melting and fusing of the hard tissue or smear layer, and subsequent sealing of the dentinal tubules.

The lasers used for treatment may be divided into two groups: low output power lasers (helium neon and gallium/aluminium/diode) and middle output power lasers (Nd: YAG and carbon dioxide (CO_2).

A diode laser is found to depress the nerve transmission of C-afferents fibers and thereby reducing dentinal hypersensitivity. CO_2 and Nd:YAG lasers create recrystallization resembling hydroxyapatite crystals and block dentinal tubules. Nd:YAG laser has been used in conjunction with sodium fluoride varnish with encouraging results showing up to 90 percent of dentinal tubules being occluded through use of this combined therapy.[43-46]

Propolis

Propolis is a yellow-brown to dark brown natural resin created by bees, used in the construction of hives. Propolis is produced from the buds of conifer and poplar trees. Propolis is a powerhouse of nutrients. This mixture of resin, essential oils, and wax mixed with bee glue (the salivary secretions of bees) contains also amino acids, minerals, ethanol (alcohol), vitamins A, B complex, E, zinc, pollen and the highly active biochemical substance known as bioflavonoids. Flavonoids are well-known plant compounds that have antibacterial, antifungal, antiviral, anti-inflammatory properties, and anesthetic effects.[47] Propolis has been used in the treatment of dentinal hypersensitivity and found to be effective.[48-50]

Topical Guanethidine

The topical application of 1 percent guanethidine on dentin has found to be effective to reduce dentinal hypersenstivity but further clinical research is needed to know the exact mechanism.[51]

Bioglass

It is a biocompatible material with osteogenic potential. Gillam DG demonstrated that bioglass could occlude dentinal tubules claiming that calcium and phosphate ions are released in an aqueous environment forming a silica gel.[52] Lee et al. used modified bioglass and found that tubules in dentin discs could be occluded by melting bioglass with Nd:YAG laser and this could have potential in clinical use to treat dentin hypersensitivity.[53]

Bleaching Agent With Amorphous Calcium Phosphate

Giniger et al. demonstrated the clinical performance of professionally dispensed bleaching gel with added amorphous calcium phosphate (ACP) and found a significant reduction of dentinal hypersensitivity both during and after the treatment.[54]

CPP-ACP (GC Tooth Mousse)

Casein phosphopeptides amorphous calcium phosphate complex has also been found to be very effective in the treatment of dentinal sensitivity.[55] CPP-ACP buffers the free calcium and phosphate ions, substantially increasing the level of calcium phosphate therefore inhibiting enamel demineralization and enhancing remineralization.

Gingival Augmentation

Gingival reconstructive surgical procedures, such as root coverage grafts, can also be considered to treat dentinal hypersensitivity.[56]

Conclusion

Clinicians should identify the etiological factors responsible for localizing and initiating hypersensitive lesions. Detailed history, accurate diagnosis and sound treatment planning are a must to manage dentinal hypersensitivity. Active management of dentinal hypersensitivity usually involves a combination of at-home and in-office therapies. In practice, professionals should adopt the regimen depending on the perceived severity of the condition and the number of teeth involved. ■■■■

REFERENCES

1. Canadian Advisory Board on Dentin Hypersensitivity: Consensus-based recommendations for the diagnosis and management of Dentin Hypersensitivity. *J Can Dent Assoc* 69:221-6, 2003.
2. Rees JS, Addy M, A cross-sectional study of dentine hypersensitivity. *J Clin Periodontol* 29:997-1003, 2002.
3. Irwin CR, McCusker P, Prevalence of dentine hypersensitivity in a general dental population. *J Ir Dent Assoc* 43:7-9, 1997.
4. Addy M, Dentine hypersensitivity: definition, prevalence distribution and aetiology. In: Addy M, Embery G, et al, eds. Tooth wear and sensitivity: clinical advances in restorative dentistry. London, Martin Dunitz, 239-48, 2000.
5. Orchardson R, Collins WJ, Clinical features of hypersensitive teeth. *Br Dent J* 162:253-6, 1987.
6. Narhi M, The neurophysiology of the teeth. *Dent Clin North Am* 34:439-47, 1990.
7. Frank RM, Steuer P, Transmission electron microscopy of the human odontoblast process in peripheral root dentin. *Arch Oral Bio* 31:91-8, 1988.
8. Brannstrom M, Astrom A, The hydrodynamics of dentin and its possible relationship to dentinal pain. *Int Dent J* 22(1):219-27, 1972.
9. Kim S, Thermal stimuli in dentin hypersensitivity. *Endod Dent Traumatol* 2:138, 1986.
10. Sena FJ, Dentinal permeability in assessing therapeutic agents. *Dent Clin North Am* 34(3):475-90, 1990.
11. Dababneh R, Khouri A, Addy M, Dentine hypersensitivity: an enigma? A review of terminology, epidemiology, mechanisms, aetiology and management. *Br Dent J* 187:606-11, 1999.
12. Addy M, Hunter ML, Can toothbrushing damage your health? Effects on oral and dental tissues. *Int Dent J* 53(supplement3):177-86, 2003.
13. von Troil B, Needleman I, Sanz M, A systematic review of the prevalence of root sensitivity following periodontal therapy. *J Clin Periodontol* 29(supplement 3):173-7, 2002.
14. Haywood VB, Dentine hypersensitivity: bleaching and restorative considerations for successful management. *Int Dent J* 52(supplement5):376-84, 2002.
15. Kleinberg I, Kaufman HW, Methods of measuring hypersensitive teeth. *Dent Clin North Am* 34(3):515-27, 1990.
16. Thrash WJ, Dorman HL, Smith FD, A method to measure pain associated with hypersensitive dentin. *J Periodontol* 54(3):160-2, 1983.

17. McFall WT, Hamrick SW, Clinical effectiveness of a dentifrice containing fluoride and citrate buffer system for treatment of dentin hypersensitivity. *J Periodontol* 58(10):701-6, 1987.
18. Kaufman HW, Wolff MS, et al, Clinical evaluation of the effect of a remineralizing toothpaste on dentinal sensitivity. *J Clin Dent* 10:50-4, 1999.
19. Zappa U, Self-applied treatment in the management of dentine hypersensitivity. *Arch Oral Biol* 39:S107-112, 1994.
20. Nagata T, Ishida H, et al, Clinical evaluation of a potassium nitrate dentifrice for the treatment of dentin hypersensitivity. *J Clin Periodontol* 21:217-21, 2003.
21. Schiff T, Zhang YP, et al, A randomized clinical trial of the desensitizing efficacy of three dentifrices. *Compend Contin Educ Dent* 21(supplement 27):4-10, 2000.
22. Sowinski JA, Battista GW, et al, A new desensitizing dentifrice: an eight-week clinical investigation. *Compend Contin Educ Dent* 21(supplement 27):11-6, 2000.
23. Schiff T, Bonta Y, et al, Desensitizing efficacy of a new dentifrice containing 5.0 percent potassium nitrate and 0.454 percent stannous fluoride. *Am J Dent* 13(3):111-5, 2000.
24. Sowinski JA, Bonta Y, et al, Desensitizing efficacy of Colgate sensitive maximum strength and fresh mint Sensodyne dentifrices. *Am J Dent* 13(3):116-20, 2000.
25. Sowinski JA, Ayad F, et al, Comparative investigations of the desensitizing efficacy of a new dentifrice. *J Clin Periodontol* 28:1032-6, 2001.
26. Wara-aswapati N, Krongnawakul D, et al, The effect of a new toothpaste containing potassium nitrate and triclosan on gingival health, plaque formation and dentine hypersensitivity. *J Clin Periodontol* 32(1):53-8, 2005.
27. Peacock JM, Orchardson R, Effects of potassium ions on action potential conduction in A- and C-fibers of rat spinal nerves. *J Dent Res* 74:634-41, 1995.
28. Markowitz K, Bilotto G, Kim S, Decreasing intradental nerve activity in the cat with potassium and divalent cations. *Arch Oral Biol* 36(1):1-7, 1991.
29. Lawson Bf, Huff TW, Desensitization of teeth with a topically applied glucocorticoid drug. A preliminary study. *J Oral Ther Pharmacol* 2(4):295-9, 1966.
30. Ong G, Desensitizing agents. A review. *Clin Prev Dent* 8:14-8, 1986.
31. Greenhill JD, Pashley DH, The effects of desensitizing agents on the hydraulic conductance of human dentine in vitro. *J Dent Res* 60:686-98, 1981.
32. Gottlieb B, Technique of impregnation for caries prophylaxis. *Wash State Dent J* 16(3):7-9, 1947.
33. Bartold PM, Dentinal hypersensitivity: a review. *Aus Dent J* 51:212-8, 2006.
34. Trowbridge HO, Silver DR, A review of current approaches to in-office management of tooth hypersensitivity. *Dent Clin North Am* 34(3):561-81, 1990.
35. Lukomsky EH, Fluorine therapy for exposed dentin and alveolar atrophy. *J Dent Res* 20:649, 1941.
36. Laufer B, Mayer I, et al, Fluoride-uptake and fluoride-residual of fluoride-treated human root dentine in vitro determined by chemical, scanning electron microscopy and X-ray diffraction analysis. *Arch Oral Biol* 26:159-63, 1981.
37. Gangarosa L, Park NH, Practical considerations in iontophoresis of fluoride for desensitizing hypersensitive dentin. *J Prosthet Dent* 39:173-8, 1978.
38. Corona SA, Nascimento TN, et al, Clinical evaluation of low-level laser therapy and fluoride varnish to treating cervical

dentinal hypersensitivity. *J Oral Rehab* 30(12):1183-9, 2003.
39. Al-Sabbagh M, Brown A, Thomas MV, In-office treatment of dentinal hypersensitivity. *Dent Clin North Am* 53:47-60, 2009.
40. Cagdiaco MC, Ferrari M, et al, Dentin contamination and protection after mechanical preparation for veneering. *Am J Dent* 9(2):57-60, 1996.
41. Suda R, Andohy SM, et al, Clinical evaluation of the sedative effect of HEMA solution on the hypersensitivity of dentin. *Dent Mater J* 9(2):163-6, 1990.
42. Low T, Effect of glass ionomer on dentine sensitivity. *J Oral Rehab* 8(1):81-9, 1981.
43. Renton-Harper P, Midda M, Nd:YAG laser treatment of dentinal hypersensitivity. *Br Dent J* 172:13-6, 1992.
44. Lan WH, Liu HC, Lin CP, The combined occluding effect of sodium fluoride varnish and Nd:YAG laser irradiation on human dentinal tubules. *J Endod* 25:424-6, 1999.
45. Moritz A, Schoop U, et al, Long-term effects of CO2 laser irradiation on treatment of hypersensitive dentinal necks: Results of an in vivo study. *J Clin Laser Med Surg* 16:211-5, 1998.
46. Ciaramicoli MT, Carvalho RC, Eduardo CP, Treatment of cervical dentin hypersensitivity using neodymium: yttrium-aluminum-garnet laser. Clinical evaluation. *Lasers Surg Med* 33:358-62, 2003.
47. Park YK, Alencar SM, Aguiar CL, Botanical origin and chemical composition of Brazilian propolis. *J Agri Food Chem* 50:2502-6, 2002.
48. Mahmoud A, Almas K, Dahlan A, The effect of propolis on female subjects with dentinal hypersensitivity *J Dent Res* 79:406-8, 2000.
49. Mahmoud AS, Almas K, Dahlan A, The effect of propolis on dentinal hypersensitivity and level of satisfaction among patients from a university hospital, Riyadh, Saudi Arabia. *Indian J Dent Res* 10:130-7, 1999.
50. Almas K, Mahmoud A, Dahlan A, A comparative study of propolis and saline application on human dentin: an SEM study. *J Dent Res* 79:1281-4, 2000.
51. Dunne SM, Hannington-Kiff JG, The use of topical guanethidine in the relief of dentine hypersensitivity: a controlled study. *J Clin Dent* 16(1):11-6, 2005.
52. Gillam DG, Tang JY, et al, The effects of a novel bioglass dentifrice on dentine sensitivity: a SEM investigation. *J Oral Rehab* 29:305-13, 2002.
53. Lee BS, Chang CW, et al, In vitro study of dentin hypersensitivity treated by Nd:YAP laser and bioglass. *Dent Mater* 21:511-9, 2005.
54. Giniger M, Spaid M, et al, A 180-day clinical investigation of the tooth whitening efficacy of a bleaching gel with added amorphous calcium phosphate. *J Am Dent Assoc* 136(3):383-92, 2005.
55. Azarpazhooh A, Limeback H, Clinical efficacy of casein derivatives: a systematic review of the literature. *J Am Dent Assoc* 139:915-24, 2008.
56. Miller PD Jr., Using periodontal plastic surgery techniques. *J Am Dent Assoc* 121(4)485-8, 1990.

TO REQUEST A PRINTED COPY OF THIS ARTICLE, PLEASE CONTACT Abhishek Parolia, MDS, at paroliaabhi@yahoo.com.

Timothy G. Giroux
DDS/Broker

ASK THE BROKER

Question:
I recently bought a practice where the selling doctor cut the "co-payment" for many of the patients. What are my issues as the buyer in this situation?

Every dentist that accepts insurance with a fee schedule has, at some point, waived a portion of their fee for a friend, family member or a patient who came into some financial hardship after the procedure has been completed. Chances are that they did not inform the insurance company that they extended that discount. Cutting co-pay technically puts the doctor in violation of the contract they signed with the insurance provider if they do not extend the discount along to the insurance company.

During the due diligence process, the buyer should be able to ascertain whether the practice "waives co-pay" on a large scale by simply looking at the basic financials. Since the UCR fee will usually be entered into the computer for the production, the production/collection percentage will be drastically lower compared to practices that don't waive co-pay. The normal lab and dental supply categories would appear higher if the practice waives co-pay. ***In any event, the financials provided to the buyer reflect the valid operating expenses of the practice.***

The only problem moving forward is that those patients who are not accustomed to paying their co-pay may become upset if they are now asked to pay when the new doctor takes over. My sage advice is that the buying doctor should not change normal operating procedures in the practice as it may adversely affect the goodwill or revenue streams for the practice. Eventually the practice will adapt to the management philosophies of the new buyer.

There are certain neighborhoods where the patient base in that area expects the dentists to simply "accept what the insurance pays". One should always consult their attorney on the contractual ramifications of "cutting co-pay", and then decide how best to deal with the issue in their particular circumstance. There are some practices that do NOT enter into the PPO contracts, but then advertise that they will accept what the insurance pays. This is perfectly legal, but normally the insurance company then pays the patient directly and not the dentist. Normally, waiving co-pay on a large scale occurs with lower income patients that may not otherwise be able to afford dental care.

In my humble opinion, we should work together to renegotiate the language in these contracts that places the dentist in violation. The insurance companies already maintain their cost containment by reducing their fee schedule, usually paying less than 80% of the standard UCR in the area. (For this reason, I eventually dropped all PPO's from my practice.) Dentists should be free to accept and negotiate whatever financial arrangement they can with the patient.

Timothy G. Giroux, DDS is currently the Owner & Broker at **Western Practice Sales (westernpracticesales.com)** 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 39, Nº3

Intraoral Radiographic Findings in Acne Calcification: A Case Report

GURMINDER SIDHU, BDS, DDS, MS; JASWINDER SANDHU, BDS; AND WILLIAM CARPENTER, DDS, MS

ABSTRACT The authors present a case report of a 52-year-old Hispanic female who presented for a routine dental exam at the Arthur A. Dugoni School of Dentistry in San Francisco. Incidental findings of multiple, calcified acne vulgaris lesions were noted in the soft tissues of the cheek that were viewed in the periapical radiographs. The findings were confirmed by a clinical evaluation of the patient's skin and past history.

AUTHORS

Gurminder Sidhu, BDS, DDS, MS, is director of the radiology division at the Department of Dental Practice, Arthur A. Dugoni School of Dentistry in San Francisco.

Jaswinder Sandhu, BDS, is a visiting researcher, Department of Dental Practice, Arthur A. Dugoni School of Dentistry in San Francisco.

William Carpenter, DDS, MSC, is chairman, Department of Pathology and Medicine, Arthur A. Dugoni School of Dentistry in San Francisco.

Acne vulgaris (AV) is a disease of adolescence and early adulthood and only occasionally persists into adult life, more commonly in females. AV chiefly affects the face, upper back, and chest and produces two types of lesions: comedones and inflammatory lesions. AV is a multifactorial condition initially requiring sex hormone release in the activation of the sebaceous glands. Three major factors are concerned with the development of this condition: androgens, sebum, and a bacterium, propionibacterium acne. The inflammation in acne lesions is derived from the breakdown products of sebaceous lipids from the byproducts of the *P. acnes* organisms and also by various immunological mechanisms produced against these organisms. Occasionally, these chronic inflammatory conditions can undergo dystrophic calcification. The authors report on one such case detected by full-mouth radiographs.

Case Report

A 52-year-old Hispanic female presented to the Arthur A. Dugoni School of Dentistry in San Francisco for a routine dental exam. The patient had a positive medical history for arthritis and severe AV as an adolescent. She had no other significant medical conditions. A full-mouth series of radiographs were made for the initial clinical examination. The posterior periapicals and bitewings, bilaterally revealed multiple, small, circumscribed radiopacities superimposed over the soft tissue of the cheeks (**FIGURES 1-3**).

No external swelling or change in the color of the skin was noted. A pitted appearance of the superficial skin, with scarring, was noted in the cheek, nose, and chin area (**FIGURE 4**).

FIGURE 1. Periapical radiograph of the maxillary right premolar area.

FIGURE 2. Bitewing radiograph of the right premolar area.

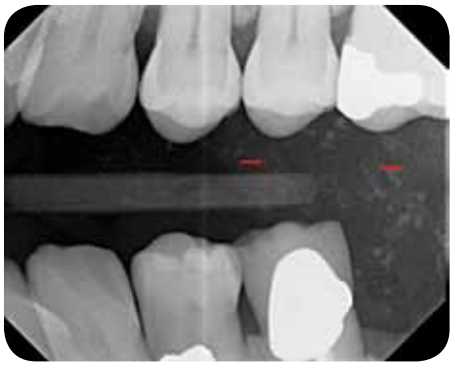


FIGURE 3. Bitewing radiograph of the left premolar area.

FIGURE 4A.

FIGURE 4B.

FIGURE 4A AND B. Right and left facial skin, respectively, with magnification revealing scarring and pitting as a result of severe acne vulgaris.

The differential diagnosis of superimposed soft-tissue radiopacities also included phleboliths, sialoliths, osteoma mucosae, myositis ossificans, calcinosis cutis, and artifacts, e.g., fixer spots.

Discussion

AV is a skin disease caused by changes in the pilosebaceous units (a skin structure consisting of a hair follicle and its associated sebaceous gland). This lesion begins with an increase in the size of the sebaceous glands and intrafollicular hyperkeratosis. The fact that it starts in this region (the excretory ducts) suggests that the sebaceous gland initiates the hyperkeratosis.

Noninflamed acne lesions appear as:

1. The clinical "blackhead" is an open comedo. The mouth of the comedones is dilated, which enables the contents to escape to the surface and it rarely becomes inflamed. The black color is due to melanin pigmentation.

2. The clinical "whitehead" is a closed comedo with only a microscopic opening, which prevents the contents from escaping. The rupture of the walls of the closed comedo sets off an inflammatory process and leads to the liberation of lipoid tissue into the surrounding dermis, with a resultant foreign body reaction. This deep inflammatory lesion is often infected with *P. acnes*, an acid-producing organism.[1-4] These inflammatory acne lesions can appear as papules, pustules, nodules, or cysts (**FIGURE 5**).

During healing, two basic processes take place. Healing by fibrous tissue may lead to hypertrophic scarring. In addition, the epidermis from the remaining follicular walls of the comedo constantly sends out sheaths of epithelium, which tend to encapsulate

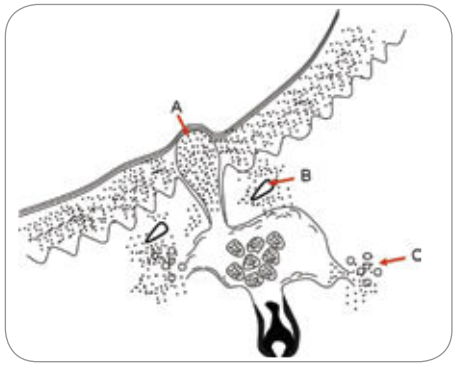


FIGURE 5A. Closed comedo. Epidermis-intrafollicular pustule. (**5B.**) Dermis-dilated blood vessels (telangiectasia) with perivascular inflammation. (**5C.**) Granulomatous reaction to contents of ruptured pilosebaceous unit.

any inflammatory mass. It is possible that in time, this inflammatory mass or the deep inflammatory lesion, which was infected with *P. acnes* may become inspissated or thickened by evaporation or absorption of fluid. This makes it possible for the tissue in the region to become more compact or dense and, hypertrophic scarring and the creation of necrotic or degenerated tissue, which occurs during healing, provide an ideal region for the formation of dystrophic cutaneous calcifications.[2-4]

These calcifications can be observed radiographically and may be present in as many as half of all cases of severe long-standing AV.[5-6] Postacne calcification was first reported by Hopkins in 1928 and later was supported by several other reports. Leider found radiographic evidence of opaque deposits in four of six patients with severe AV of long duration.[7]

Leider and Basler et al. examined soft-tissue radiographs of 20 patients with long-standing AV and found opaque densities in 50 percent to 60 percent of these cases.[5,7] Several patients had firm papules but most had no clinically obvious lesions. There is no correlation between the severity of AV scarring and the presence of calcification. Calcium deposit in the skin is traditionally divided into four broad categories: metastatic, dystrophic, iatrogenic, and idiopathic. Calcification in AV is considered an inflammatory dystrophic calcification.[8,9]

According to Basler et al., deposition of calcium may vary between calcification without ossification and true heterotrophic bone formation.[5] The clinically identifiable form of calcium deposition in long-standing AV has been described in numerous reports as representing true metaplastic ossification.[10,11] Cutaneous ossification may be primary or secondary. Primary ossification occurs when there is no preceding cutaneous lesion. Secondary (metaplastic) ossification occurs within pre-existing cutaneous lesions e.g., long-standing acne.[12,13] Leider suggested that all cases of calcification might represent a metaplastic process secondary to the traumatic rigors to which the facial skin is exposed.[11] No histopathological evaluation in this case was performed to resolve this issue.

Conclusion

The authors have presented a case report of a patient with severe AV as an adolescent. This condition underwent calcification as was detected in periapical radiographs. Dentists should be aware of this phenomenon, which they may visualize on their radiographic examination. ■■■■

REFERENCES

1. Lever WF, Histopathology of the skin, ninth ed., Philadelphia, pages 469-71, 2005.
2. Marks JG, Miller JJ, Lookingbill and Marks' principles of dermatology, fourth ed., pages 189-94, 2006.
3. Strauss JS, Kligman AM, The pathologic dynamics of acne vulgaris. *Arch Dermatol Syph* 82(5):779-90,1960.
4. Ennis LR, Roentgenograhic appearance of calcified acne lesions. *J Am Dent Assoc* 68(3): 351-7, 1964.
5. Basler RS, Walers JH, Taylor WB, Calcifying acne lesions. *Int J Dermatol* 16:755-8, 1977.
6. Ratnavel RC, Burrows NP, Pye RJ, Osteoma cutis as a sequela of acne. *J R Soc Med* 87:107-8, 1994.
7. Leider M, Osteoma cutis as a result of severe acne of long duration. *Arch Dermatol Syph* 62:405-7, 1950.
8. Barnhill RL, Crowson AN, Textbook of dermatology, second ed., pages 400-2, 2004.
9. Basler RS, Taylor WB, Peacor DR, Post-acne osteoma cutis: x-ray diffraction analysis. *Arch Dermatol* 110:113-4, 1974.
10. Leider M, Osteoma cutis. *Arch Dermatol Syph* 61:329-30, 1950.
11. Leider M, Osteoma cutis, report of case. *Arch Dermatol Syph* 58:168-76, August 1948.
12. Thielen AM, Stucki L, et al, Multiple cutaneous osteomas of the face associated with chronic inflammatory acne. *J Eur Acad Dermatol Venereol* 20:321-6, 2006.
13. Baginski DJ, Arpey CJ, Management of multiple miliary osteoma cutis. *Dermatol Surg* 25(3):233-5, March 1999.

TO REQUEST A PRINTED COPY OF THIS ARTICLE, PLEASE CONTACT
Gurminder Sidhu, BDS, DDS, MS, Arthur A. Dugoni School of Dentistry, 2155 Webster St., San Francisco, Calif., 94115.

Professional Practice Sales of The Great West

Specialists in the Sale and Appraisal of Dental Practices

Serving California Dentists since 1966

Where turning "For Sale" into "Sold" is a practiced art!

5980 **LAKE TAHOE** $850,000+ per year. Attractive Profits. Beautiful 6-Op suite. 4-days of Hygiene. 20+ new patients per month. Low AR balance.

5993 **SAN FRANCISCO'S FINANCIAL DISTRICT – "JUST SOLD"** The Financial District is the most densely populated area in SF during work day. 3-days of Hygiene. $350,000/year. 3-Op suite. Great California Street location.

5997 **FREMONT- "JUST SOLD"** Store front on busy boulevard. 2009 collected $360,000 with Profits topping $143,000 on 3-days. 6-months ended 6/30/10 collected $170,700 with Profits of $80,000. 5-Ops, 3-equipped.

5999 **PLEASANTON** Located at intersection of I-580 & I-680 adjacent to Hacienda Business Park. Highly visible suite in busy shopping center. 3-Ops with 4th wired and plumbed. Computerized Ops, intraoral cameras, digital radiography. 2010 collected $692,000. Profits of $402,800.

6000 **MILLBRAE** Great location, computer charting, digital radiography, strong patient base. 2010 collected $725,000. 1,180 sq.ft. suite has 4-Ops, 3-equipped. High-end features make for a truly enjoyable patients experience.

6002 **SAN JOSE'S SILVER CREEK** Located in San Jose's most desirable neighborhood. Well established, maintains 4-day per week Hygiene Schedule. Averages $600,000 year in collections with attractive Profits. Housed in new 3-year old suite. 4-Ops with computers. Lots of patients here.

6003 **PINOLE - HERCULES AREA** Cornerstone here is 4-day Hygiene Department & 90%+ effective Recall. Produced $740,000 and collected $709,500. Low AR balance. Endo referred, and only PPO Plan is Delta Premiere.

6004 **SAN JOSE'S SANTA TERESA AREA** "Signature" facility with 600 patient files for little more than what it would cost to replicate this office today. Digital and paperless 3-Op office. 40+ new patients per month. 2010 produced $385,000 with collections of $277,000 and Profits of $190,000+. Gorgeous 1,024 sq.ft. facility leases for $2,000/month. Lease allows occupancy here thru 9/30/2024.

6005 **FAIRFIELD - WEST OF I-80** Craves attention of full-time Successor. Operating on 2.5 week schedule by Owner with other commitments, practice has averaged $470,000 in collections last 3-years. 2-days of Hygiene, averages 20 new patients/month. Attractive 3-Op suite. High visibility location.

For complete details on any of these opportunities, go to www.PPSsellsDDS.com

Professional Practice Sales of The Great West

Ray and Edna Irving

(415) 899-8580 ~ (800) 422-2818

www.PPSsellsDDS.com

Thinking on selling your practice? Call "PPS of The Great West" today.
This shall be the best decision you make regarding this important change in your life!

"I listed with a competitor for 12 months. Had two people visit my practice. First weekend PPS had my listing, I had 3 people visit and an offer by the end of the first week. Thank you for allowing me to move on to the next step of my life."

"It was a pleasure to work with PPS. I had to sell because of health complications. Mr. Irving listed my practice on Jan 1st, we closed escrow on Feb 27th. It took him less than 60 days to complete the sale as promised."

"When I decided to sell my ortho practice, I sought the services of a large company. Over the 12-month contract, I had one buyer visit. Word was out. It had a devastating effect on my bottom line. Fortunately, I found Ray and Edna Irving! When I finally sold, I choose between two good offers. My regret was the time and money lost with the other guys."

"When I signed the Listing on June 1st, Ray stated he would have the practice sold by Labor Day. The sale was concluded on Sept 1st, two days before Labor Day. Wow!"

"I will always remember your statement when I questioned your contract being only four months. You stated: 'If I can't sell your practice in that time, you should get someone else.' Well, you did with time to spare!"

"Before I called Ray, I had a listing with another prominent Broker. After eleven months without a sale, I called Ray. He sold it in about a month! Would I recommend Ray? Yes!"

"In April, I asked Ray Irving to sell my practice. At the same time my friend decided to sell his practice. He employed another firm. My practice sold June 22. My friend's practice still hasn't sold and he was putting his dreams on hold."

PPS of The Great West's reputation is built upon grounded ethics and effectiveness. Our trademark "client services" include accurate assessments, impeccable marketing plans, complete transparency, generating quick responses, realizing multiple Offers, securing 100%+ financing in days, expert papering of our transactions and sound counsel. Everything is done to protect our Client and to effect a successful transfer. Our intent is simply to provide the best service imaginable for this very important engagement.

CA DRE License #1422122

Specializing in the Selling and Appraising of Dental Practices

CALIFORNIA PRACTICE SALES INC.

Serving California Since 1974

"Your local Southern California Broker"

Phone (714) 639-2775
(800)697-5656
Fax (714) 771-1346
E-Mail: jknipf@aol.com
rpalumbo@calpracticesales.com
WWW.CALPRACTICESALES.COM

John Knipf & Robert Palumbo

LOS ANGELES COUNTY

BEVERLY HILLS – Leasehold & equip only! Located in multi-story historical med/prof. building with parking options. ID #3601
CENTURY CITY GP – Well established practice located in a multi-story med/prof. building. 5 fully ep. ops w/Dentrix. ID #3581
DIAMOND BAR – Leasehold & equip only! Great opportunity for a GP or Specialist. Located in a 2 story bldg with 12 eq ops. ID #3721
HOLLYWOOD – Equipment & some charts! Located in general purpose bldg with 5 fully eq. ops. Good exposure. ID #3761
LONG BEACH GP – Established in 1952, this modern, refurbished office is located in a 2 story medical/dental building. ID #3921
LOS ANGELES GP – Building for sale! Well established practice with 32 yrs of goodwill. Excellent signage. Great staff. ID #3771
LOS ANGELES GP – Located in a 2 story busy shopping center with great exposure & valet parking. Equip. with charts only. ID #3861
LOS ANGELES – Over 20 years of goodwill this turn-key practice is located in a 7 story med/dent building. Low sale price! ID #3791
LOS ANGELES – Long established practice located in a shopping center with heavy traffic flow. NET $58K. ID #2771
MALIBU GP – Located in a very desirable upscale area w/excellent exposure. Fee-for-service practice. High quality dental care. ID #3651
MONTEBELLO – Price Reduced! Long established practice in a single story busy shopping center. Leasehold, equip. & charts. ID #2701
SAN GABRIEL GP – 4 fully eq. office located in a single free standing bldg. Excellent exposure, visibility and signage. ID #3701
SOUTH GATE – Leasehold & equip only! Corner location with heavy traffic flow. Priced for an immediate sale. ID #3911
UPLAND / CLAREMONT Ortho – Long established practice located a med/dent building with low rent. ID #3681
VALENCIA GP – State-of-the-art office w/condo suite available for purchase. 3 year old equipment. Fee-for-service practice. ID #3741
WOODLAND HILLS PEDO – Well equipped Pedo office with 3 chairs in open Bay area. Fully computerized. NET $308K. ID #3661

ORANGE COUNTY

ALISO VIEJO – Beautiful spacious practice with 4 fully eq. ops. Great opportunity for GP or Spec. Leasehold & equip only! ID #3831
ALISO VIEJO – Price reduced! Modern design turn-key practice with great views and beautiful decor. ID #3301
GARDEN GROVE GP – Turn-key, 3 fully eq. ops., located in a 2 story professional building. Good exposure. Low sale price! ID #3561
IRVINE – Price reduction! Leasehold & equip. only. 5 eq. ops., 1,450 sq. ft suite located in busy Ralph's shopping center. ID #3401
IRVINE GP – Practice located in a busy shopping center next to a medical building. Easy freeway access. 100% patient referral. ID #3471
IRVINE GP – Established in 1987, practice is located in 3 story med/dent building. Next to busy shopping center. NET $74K. ID #3901
LAKE FOREST – Modern design office with state-of-the-art equip. 4 fully eq. ops, and 2 plumbed eq. ops. Leasehold & equip. ID #3631
MISSION VIEJO GP – Well established fee-for-service practice located in a single story busy shopping center. NET $126K. ID #2061
ORANGE GP – Well established practice located in a single story medical center with 4 fully eq. ops., 1 plumbed not eq. ID #3531
YORBA LINDA – Turn-key practice located in free standing building with heavy traffic intersection & excellent street visibility. ID #3711

RIVERSIDE / SAN BERNARDINO COUNTIES

CORONA – Price reduced! Equipment & some charts! Located a busy shopping center with heavy traffic flow. ID #3431
HEMET – Established 30 yrs ago. Beautiful practice consists of 3 eq. ops & 1 plmbd not eq. Located in a busy shopping center. ID #3851
RANCHO CUCAMONGA – Leasehold & equip. only! 6 eq. ops., 1,800 sq. ft. suite located in 2 story med/dent building. ID #3191
TEMECULA – Turn-key practice located a 2 story building with 4 eq. ops. Easy access to freeway. Low sales price! ID #3731
VICTORVILLE – Fee-for-service practice, located in single standing building with over 55 years of goodwill. Building for sale. ID #3861

SAN DIEGO COUNTY

SAN DIEGO – Long established General Practice located in a 3 story medical glass building with 3 fully eq. ops. NET $222K. ID #3671
SAN DIEGO – Leasehold & equip only! Office consist of 5 eq. ops., with Dentrix software. Good location w/heavy traffic flow. ID #3141
VISTA – Well established practice with 31 years of goodwill. Consists of 3 computerized eq. ops & 2 plmbd not eq. NET $104K. ID #3781

*** UNDER OFFER**

Call us about Debt Consolidation & Retirement Planning

VISIT OUR WEBSITE WWW.CALPRACTICESALES.COM

CA DRE #00491323

John Knipf
President

(Neff)

Also serving you: Robert Palumbo, Executive V. P. /Partner, Alice C. King, V.P., Greg Beamer, V.P., Tina Ochoa, V.P., & Maria Silva, V.P.

Classifieds

EQUIPMENT FOR SALE

EQUIPMENT FOR SALE — Two interior dental operatories including dental equipment — chairs, x-rays, pano, sterilizers, etc. Dental instruments for sale as complete package. Contact ttigertdds@yahoo.com.

OFFICES FOR RENT OR LEASE

BAKERSFIELD PEDIATRIC DENTAL OFFICE FOR RENT/LEASE — Long established pediatric dental office. Four plumbed operatories. Newly remodeled. Quiet room. 1,000 sq. ft. office. Tremendous amount of underserviced young families in the area. $1250 a month. Please call 661-871-0780.

DENTAL SUITE IN SANTA ROSA — Renovated 1,500 sq. ft. office. Has some new equipment and furnishings. Very reasonable rent. Contact 707-494-8498 or e-mail jsmuthy@aol.com.

DENTAL SUITES FOR LEASE IN SILICON VALLEY — Renovated ortho, pedo, and general space with views in Los Gatos, an affluent community. Close to schools, downtown and freeway. Contact Trask Leonard at 650-282-4620, e-mail at tleonard@baysiderp.com or e-mail owner at 2340akmeadow@sbcglobal.net.

EXCLUSIVE DENTAL SUITES FOR LEASE — Short/long term lease, state-of-the-art equipment and accommodations. Conveniently located off the 101 freeway. Laura Miller 818-758-3557.

SAN FRANCISCO OFFICE FOR RENT — Beautiful view dental office 450 Sutter 16th Floor, remodeled in 2009. Three completely equipped and spacious operatories. Fully equipped, large staff/lunch room. Doctor's private office. Wednesdays and Fridays currently available. Call 415-392-3689 or e-mail drtuftoffice@gmail.com.

SANTA CLARA OFFICE FOR RENT OR LEASE — Fully equipped, six operatories, ample parking, free standing one story building, approximately 1,800 sq. ft. Close to Santana Row. Option to buy. Call 619-644-2906.

SF BAY AREA/VALLEJO PROFESSIONAL BUILDING — 1,000-5,000 sq. ft. existing dental/orthodontic office. Inquiries call 707-994-1218.

CONTINUES ON 186

How to Place a Classified Ad

For information on placing a classified, contact Jenae Gruchow at 916-554-5332 or Jenae.Gruchow@cda.org.

The deadline for classified advertising is the first day of the month, prior to the month of publication. After the deadline closes, ads will not be accepted, altered or canceled. Deadlines are firm.

Licensed agents and brokers may not place classified ads. For information on display advertising, please contact Corey Gerhard at 916-554-5304 or Corey.Gerhard@cda.org.

CDA reserves the right to edit copy and does not assume liability for contents of classified advertising.

CLASSIFIEDS, CONTINUED FROM 185

OFFICES FOR SALE

LEASEHOLD/LEASEHOLD WITH EQUIPMENT — Nicely equipped 1,250 sq. ft. four operatory office with nice cabinetry and full digital in the heart of the hip Mission district in San Francisco. Dentist moving into newly purchased building and is extremely motivated. Save tens of thousands. Very reasonable lease. Call 415-507-7593 or e-mail ericdebb@msn.com.

OPPORTUNITIES AVAILABLE

DENTAL JOBS AVAILABLE — Aspen offers tremendous earning potential and a practice support model that empowers dentists. We eliminate obstacles for dentists to own their own practice. Call 866-745-5155 or visit aspendentaljobs.com. EOE

OPPORTUNITY AVAILABLE — Dentist for established Roseville dental office. Mail: Attn: HR, Healthy Image Dental Group 576 N. Sunrise Ave, Ste 140, Roseville CA 95661.

OPPORTUNITY AVAILABLE — Dentist with CA dental license for established Elk Grove dental office. Mail: Attn: Dr. Acosta-Cuevas DDS, 8461 Elk Grove Blvd, Elk Grove, CA 95758.

OPPORTUNITY AVAILABLE IN NORTHWESTERN WASHINGTON — Seeking experienced dentist for busy, established, rapidly growing, fee-for-service group dental practice. Excellent immediate income opportunity ($180K to $375K + per year) depending on productive ability and hours worked. Secure long-term position. You can concentrate on optimum patient treatment without practice management duties. Newly equipped, modern office with excellent staff and lab services provided. If you are bright, energetic with a desire to be productive, very personable, people oriented and have great general and specialty clinical skills, please fax resume to Otto J. Hanssen at 425-484-2110.

CONTINUES ON 190

WESTERN PRACTICE SALES

John M. Cahill Associates

BAY AREA

A-8941 SAN FRANCISCO– Ready to Move In. Fully Equipped. 2 ops. Plumbed for 1 add'l **$75k**

A-9361 SAN FRANCISCO– Blocks from Union Square! 17 story building. 975 sf w/4 ops **$550k**

B-9381 OAKLAND - GP in Bustling Area! 1148 sf w/2 ops. **Only $75k**

B-9541 BRENTWOOD - Facility Only Centrally located in a highly visible shopping complex w/ ample parking in a well-established neighborhood. 2,203sf & 6 ops **$230k**

C-7811 SOLANO CO - 2,997 sf w/6 ops + 2 Hyg ops + 1 add'l op! Buy the whole practice for $1.3m or only 50% for $650k. **Call for Info!**

C-880 PETALUMA— HMO practice in a Professional medical plaza. Doctor averages 10 patients per day. 800sf and w/ 2 ops, **$295k**

C-8901 SANTA ROSA– Residential area. 40+ new pats/mo. Highly Visible! 1291sf & 3 + 1 op. **$475k**

C-9471 SANTA ROSA -Stable patient base, well-respected practice. Dental building w/excellent signage on major thoroughfare. 1,500 sf w/5 ops **$495k**

C-9501 MARIN COUNTY–Remarkable oppty awaits you! Near HWY 101.~ 800 sf w/3 ops. **$300k**

D-842 PLEASANTON –1,488sf w/ 2 ops **$295k**

D-845 SAN JOSE - *Facility* -Attractive office. Traditional décor. Retail Plaza. 2,240 sf & 5 ops. **$150k**

D-877 LOS ALTOS -Pristine Professional plaza. Office is ~ 2,400sf - 6 ops **2009 Collections - $819k!! Asking only $425K**

D-9091 ATHERTON -Turnkey operation – no construction hassles, equipment purchase. Would cost nearly twice our asking price to duplicate. 969 sf & 3 ops ***Call for Details!***

D-912 SALINAS - Doctor averages 8 patients w/ 8 Hygiene patients per day and generates ~20+ new patients per month. 1,200sf 3 ops. **$275k**

D-925 SANTA CLARA - Family-oriented office. 35+ new patients/month by internal marketing: word-of-mouth referrals of quality care and relationships. Retail Shopping Center in the heart of the Silicon Valley. 1,500 sf & 3 ops **$499k**

D-939 SAN JOSE - Doctor averages 5 patients daily. Office is ~1,522 sf w/5 ops **Only $195k**

D-9331 SARATOGA– FACILITY- General Dentistry & Specialists! State of the Art Equipment in excellent condition 1,187sf w/3 ops **$98k**

NORTHERN CALIFORNIA

E-729 AUBURN - Busy retail shp ctr w/excellent signage & good traffic flow. 1750sf, 4ops. Plumbed for 2 add'l ops **$250k**

E-7121 SACRAMENTO AREA – Largely FFS. 1800sf, 4ops (+2 add'l plumbed). . **$695k**

E-881 SACRAMENTO-State-of-the-art Practice with growing patient base. 2,400 sf & 3 ops. Plumbed for 3 add'l. Seller flexible w/ transition plans **$250k**

E-915 ELK GROVE—Averages 8 patients w/ approx 5-6 new pats/month. Located in an attractive professional building. 1,200sf / 4 ops. **$650k**

E-8641 SACRAMENTO-FACILITY Fast Growing Area w/easy access to Tahoe and SF Bay! Single Story office near county buildings. 2,100+ sf w/ 3 ops & plumbed for 1 add'l **$50k**

E-955 ELK GROVE First-floor suite in desirable commercial corridor. Giant foyer/spacious office w/ spectacular décor. 3 ops. Plumbed for 2 add'l **$375k**

G-751 RED BLUFF/CHICO- Complete remodel ~5 yrs ago. FFS GP. 2350sf /4 ops. Plumbed for 2 add'l. **Practice $125k / Real Estate $185k**

G-875 YUBA CITY–Estab. 30 + years, GP, FFS, 3575sf /9 ops, great location. **$1.5m**

G-883 CHICO VICINITY – Quality FFS GP. Attractive Prof Plaza. 1,990 sf w/ 5 ops **$535k**

H-668 NORTHEASTERN CA–4 ops 1600sf office. 2007 gr rcpts exceed $650k! **$395k**

H-856 SOUTH LAKE TAHOE Over 50 new patients/mo Respected & Growing! 1568 sf & 4 ops **$425k**

I-685 TURLOCK - 1700sf, 7 ops. Recently remodeled. Free standing bldg. Mostly Adec Eqpmt. **REDUCED! NOW ONLY $305k**

CENTRAL VALLEY

I-772 *Facility* STOCKTON-Desirable, affluent health care area. 2,140sf/4 ops **$150k**

I-889 MERCED- Heart of town, bustling with activity & foot traffic. 3 ops **$265k**

I-923 MODESTO—1495sf/ 4op+1, Newer, All digital. **REDUCED! $250K**

I-945 TRACY - Young, growing, family-oriented practice. Highly motivated patient base. 1,300 sf & 4 ops **$350k**

CENTRAL VALLEY CONTINUED

I-949 MODESTO -Spacious office w/ brand-new build-out and equipment that has never been used which would cost more than our asking price to duplicate! Reasonable rent/Great lease. Retail Shopping Center. 1,250 sf w/ 4 fully equipped ops **$149k**

J-928 ATWATER - Well-established & respected for gentle treatment. Prof Bldg in desirable area. 1,313 sf w/3 spacious ops **$230k**

J-943 CLOVIS FACILITY ONLY—This Practice would cost more to duplicate! Located in a highly visible shopping center. Office is ~2,098sf w/ 6 ops **$95k**

SOUTHERN CALIFORNIA

K-887 ESCONDIDO-Beautifully landscaped dental prof bldg 1,705 sf w/5 ops **$175k**

K-916 SANTA MARIA—Location and reputation are only two of the winning attributes of this stunning practice! 1,545 sf, w/ 4 fully equipped ops, **$300k Real Estate also available!**

SPECIALTY PRACTICES

I-7861 CTRL VLY ORTHO- 2,000sf, open bay w/8 chairs. Garden View. 45 years Goodwill. FFS. 60-70 patients/day. Prof Plaza. **$370k**

D-892 MORGAN HILL ORTHO- Remarkable Oppty! Floor to Ceiling windows—wooded courtyard. 1900sf & 6 chairs in open bay. **$275k**

H-913 SIERRA FOOTHILLS ORTHO– Strong, loyal base referral base. Practice averages 30 – 60+ pats/day. Pristine, remodeled building w/ ample parking. 2,600 sf w/ 5 chairs/bays **$500k**

K-929 SANTA MARIA – PROSTHODONTICS - Where "the patient comes first". Restorative/Implant Practice, FFS, 3 ops 1400 sf **$450k**

I-9461 CENTRAL VALLEY/ORTHO - Seller has strong referral base and happy patients! Well-respected for excellent, quality service in this family-oriented community. 1,650 sf w/5 chairs/bays plus (2) additional plumbed. **$140k**

Timothy G. Giroux, DDS

Jon B. Noble, MBA

Mona Chang, DDS

John M. Cahill, MBA

Edmond P. Cahill, JD

800.641.4179

View all of our available practices at:

w e s t e r n p r a c t i c e s a l e s . c o m

CARROLL & COMPANY

"MATCHING THE RIGHT DENTIST TO THE RIGHT PRACTICE"

Complete Evaluation of Dental Practices & All Aspects of Buying and Selling Transactions

Serving you: Mike Carroll & Pamela Gardiner

3041 SOUTH BAY GP

Well est. & successful practice in gorgeous state-of-the-art facility located in a most desirable area. Modern equipment updated in 2007 and near paperless office. Equipment includes Gendex digital x-rays, Panorex, Cerec & Dexis. 1,653 sq. ft. facility w/6 fully-equipped ops. Avg. GR for past 5 years 1.6M w/59% overhead. 2010 GR as of Aug. on track for 1.5M+. Quality staff. Long term lease available. This is an outstanding opportunity for the experienced dentist looking for a high quality practice. Asking $1.3M.

3049 SAN JOSE GP

Well-located, across from O'Connor Hospital, general practice in 2,118 sq. ft.state-of-the-art facility w/ 3 fully-equipped ops. 2 pvt. offices (1 can be plumbed for 4th op.). This office is beautifully designed and is stunning. In addition to his general practice, owner treats sleep apnea patients. He is selling just the general operative portion of the practice and is willing to help for a smooth transition. Ideal for an experienced dentists looking to merge an existing practice.

3048 SAN JOSE GP

Owner retiring from a small well-est. practice with great upside potential. 900 sq. ft. office with 3 ops. near medical center. 3 Dr. days/ week. Owner willing to help for a smooth transition. Asking $95K.

PENDING

3050 EAST SAN JOSE FACILITY

Exceptional opportunity for a beautiful state-of-the-art, first class facility with 8 large ops. & 2 pvt. rooms, in a well traveled area. 1 level shopping center almost fully-equipped office with high visibility signs near E. Capital Expressway and 101. If you want exposure, this is the place to be. Asking $190K.

3045 VACAVILLE GP

Turn-key, traditional dental practice with loyal staff and sense of community. Well maintained 900 sq. ft. tastefully decorated office with 2 fully-equipped ops. 2009 GR 224K+, 2010 projected GR as of Aug. $270K+ with 50% avg. overhead. Owner retiring and willing to help for a smooth transition. Asking $172K.

3006 MONTEREY COUNTY ORTHO

Est. Ortho practice in 2,668 sq. ft. office with 5 open bay chairs in a professional dental complex. Panorex and Cephlometric X-ray machines. Stable and loyal referral base. Annualized GR as of Oct 2009 are $335K+. Owner retiring and willing to help for a smooth transition. Asking 227K.

3028 NAPA-SOLANO COUNTY GP

Owner retiring from well-est. practice in 1,400 sq. ft. facility with 5 ops. All fee-for-service pts. with great word-of-mouth reputation. 2009 GR $731K+, June 2010 FY on schedule for $771K + with just 4/doctor-days. Asking $518K.

3047 WEST SAN JOSE GP

Owner retiring from well-established practice in professional dental building with 3 ops in 950 sq. ft. office. Ideal location near O'Connor Hospital, Town & Country Village and Valley Fair Shopping Center. Avg. GR $169K+ w/ 60% overhead. Asking $95K.

SOLD

3037 PLACER COUNTY GP

Well est. Placer County General & Cosmetic Practice. 6 fully-equipped state-of-the-art ops., in single story 2,700 sq. ft. stand alone professional building. Avg. GR for past 4 years $1.4M+ with 61% overhead and just 4 doctor-days/week. Seller owns the building and will provide buyer with a fair market lease or sell the building to buyer. Asking $1,134,000.

SOLD

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

CA DRE #00777682

HENRY SCHEIN®
PROFESSIONAL PRACTICE TRANSITIONS

"DENTAL PRACTICE BROKERAGE"
Making your transition a reality.

More information is available on our website regarding practices listed in other states, articles, upcoming seminars and more.

For more information regarding the listings below:
VISIT OUR WEBSITE AT:
WWW.PPTSALES.COM
(Practice Opportunities)

Practice Sales • Mergers
Partnerships • Appraisals
Patient Record Sales

- **APTOS:** *For Sale* - General Dentistry Practice. Highly desirable location. 2008 Gross Receipts over $1Mil. w/adjusted overhead at 51%. 3-operatories in 1,000 sq. ft. Pano & Modi computerized software. 9-hygiene days per week. Practice operated for past 33 years in same location. Open 5 days a week. Owner willing to work back for new owner 2 days/wk. #14305
- **BIG BEAR CITY:** *For Sale* - General Dentistry Practice. 26 years at current location. Gross Receipts $428K. 3-equipped operatories. Doctor owns the building. New lease available or option to purchase.
- **EL DORADO HILLS:** *For Sale*-General Dentistry Practice. 2009 GR $790,758 adjusted net income of $[illegible]2K. Intra-Oral camera, Pano, Softdent software, 4-equipped ops 4-hygiene days. Practice has been in its present location for past 18 years. Owner retiring. #14324
- **FAIR OAKS/FOLSOM/GOLD RIVER:** *For Sale*-Gross Receipts in excess of $1.1 Million dollars for the past three years. Adjusted net $450K. 2,400 sq ft office-5 ops. Hygiene days-6, Owner works 32 hours per week. Eagle Soft, Laser, Pano Intra-Oral camera, fiber optics. Owner retiring. #14343
- **FOLSOM:** *For Sale*-General Dentistry Practice. Gross Receipts in 2010 were $703K, 3 1/2 day week with adjusted net income of $300K. 5 days of hygiene and approx. 1,500 active patients. Leased office is 2,000 sq. ft. with 4 equipped operatories - 5 possible. Patient Base software. Owner to retire.
- **FOLSOM:** *For Sale* - General Dentistry Practice. Gross Receipts in excess of 1.5M the past three years. 2009 Adjusted Net of $550K. 2,700 sq. ft. office with 7 ops, Digital, Dentrix, Intra-Oral camera, Laser, 5+year old equipment, 8 days hygiene. Beautiful office, great location. Owner retiring. #14336
- **FOLSOM:** *For Sale* - General Dentistry Practice 2009 Collections $513K. Adjusted net income $184K. 4 Ops (plumbed for 5), Intra-Oral camera, fiber optics all ops. Patient base software. Owner retiring. #14329
- **GRASS VALLEY:** *For Sale*-General Dentistry Practice. 2009 GR of $307,590 (3 days/wk) with adjusted net income of $105K. 3 Ops. refers out most/all Ortho. Perio, Endo, Surgery. Laser, Intra-oral camera, Diagnodent, EZ Dental Software. Good Location. Owner retiring. #14337
- **GREATER SACRAMENTO:** *For Sale*-Pediatric Practice. 2010 GR of $1,095,914, with a 45% overhead. Prevention oriented practice with 2,600 sq. ft. Digital office with Dentrix. Equipment is nine years old. Delta Premier is only insurance. Owner retiring.
- **LAGUNA NIGUEL:** *For Sale*-General Dentistry Practice. 2010 gross receipts were $503k. 4 operatories, Pan, computerized with EZ dental software. 1,500 sq. ft. lease. 10 years in present location. Owner retiring.
- **LAKE COUNTY:** *For Sale*-General Dentistry Practice. Gross Receipts 904K with adjusted net $302K. Practice has been in same location for past 23 yrs, and 25 yrs in previous location. 2,600 sq ft with 8 equipped treatment rooms. Intral-Oral camera, Pano, and Data Con software. Owner to retire. #14338
- **LIVERMORE:** *For Sale* - General Dentistry Practice. 2009 Collections were $688K with an adjusted net income of $287K. There are 4 ops in this nicely updated 1,092 sq. ft. office space. Dentrix software, 6-days/wk hygiene. Owner has been in same location for 36 years with long-term employees. Owner is retiring. #14326
- **LOS ANGELES:** *For Sale* - General Dentistry Practice.1,200 sq ft 4ops, 29 yrs in present location. Gross Receipts $274K with adjusted net income of $89K. Owner to retire.
- **LOS ANGELES:** *For Sale* - General Dentistry Practice: This practice 80% Dentical and has approximately 2000 active patients. Owner has operated in same location for 31 years. 2009 receipts were $709,000. 6 equipped ops, 5 rms, laser, Intra-Oral camera Pano and Ceph. Call for details. #14319
- **MODESTO:** *For Sale* - General Dentistry Practice. 5 operatories, 32-years in practice. Gross Receipts $884K w/adjusted net income of $346. Dentrix, Cerec, and Intra-Oral camera. Owner to retire. #14308
- **NAPA:** *For Sale* - General Dentistry Practice. Gross Receipts $800K, with adjusted net income of $250K. Fee for Service. 1300 sq ft 4 ops 6 hygiene days. 38 yrs in present location, 30 yrs in previous location. Owner to retire.
- **NORTHERN CALIFORNIA:** *For Sale* - Pediatric practice. Owner has operated in same location for 32 years. Approx. 1,760 active patients, 1,160 sq. ft., Panoramic X-ray, Dexis Digital and Dentrix software in this 5-chair office. 2009 Gross Receipts $713K with 48% overhead. Owner retiring. Call for details. #14322
- **OCEANSIDE:** *For Sale* - Modern looking office. 4 op, office space and equipment only. Belmont chairs. Gendex x-ray system, intraoral camera, approx 1200 sq ft. Low overhead-Rent is $1,900/month, and it's a 5 year lease. Staff is available for rehire-front desk $15/hr, assistant 13/hr. Update all the computer systems after purchasing the office in 07. Computers and monitors in every room. #14346
- **PALM SPRINGS:** *For Sale* - General Dentistry Practice. Fee for Service. 2009 Gross Receipts $282K with adjusted net income of $157K. 1,280 sq. ft., 3 equipped operatories. Intra-Oral camera, Pano, Practice-NEB software. Doctor willing to transition by working 1-2 days a week. #14332
- **PLUMAS COUNTY:** *For Sale*-3 equipped ops. Space available for 4th op. 1,245 sf office in good location. 2009 gross receipts $475K. Practice in present location over 50 years. Owner is retiring. #14318
- **REDDING:** *For Sale*-Owner looking for Assoc. trans. into Partnership w/Buy-Out. GR $1 Million dollars income $436K. 5.5 days hygiene, 2,200 sq. ft. #14293
- **RENO:** *For Sale* - General Dentistry Practice and Dental Building: 2009 Gross Receipts $517K with adjusted net income of $165K. 4 ½ hygiene days/week. 1, 800 sq. ft. with 6 equipped ops. (7 Avail). Dentrix software, Pano. Practice has been in its present location for 40 years. Owner retiring.
- **ROCKLIN:** *For Sale*- General Dentistry Practice. Gross Receipts $593K in 2010 with $240K adjusted net income. Office is 1,630 sq. ft., with 4 operatories equipped with fiber optics. Owner has been in present location for the past 13 years. 3 1/2 days hygiene. Intra-Oral camera, Dentrix software. Owner to retire.
- **ROSEVILLE:** *For Sale* - General Dentistry Practice. Great Location. 2009 GR $900K with adjusted net income of $300K. 1,975 sq. ft. with 4 ops, 8 days hygiene/wk. Digital, Intraoral camera, Dentrix, Trojan, fiber optics, P & C chairs - all less than 5 years old. Owner is retiring. #14327
- **SACRAMENTO/ROSEVILLE:** *For Sale* - One of many partners is retiring in this highly successful General Dentistry Group Practice. Intra-Oral camera, Digital Pano-Dexis, electronic charts, owner Financing. Call for further information. #14334
- **SAN FRANCISCO:** *For Sale-Patient Base for Sale*-Owner passed away last June and the practice has continued on 4 days a week with an associate. Lease can't be renewed. There are approx. 1,000 acive patients in the practice. The patient base can be purchased at no risk to buyer since the purchase price is paid according to the receipts collected on the patients that transfer. #14312
- **SAN DIEGO:** *For Sale*-General Dentistry Practice. This office is plumbed for 4 ops. 3 ops. are equipped with Promo Equipment. Lease is $2,200 per month. 2009 receipts were $185,645. PPO and Fee for service practice. #14313
- **SAN DIEGO:** For Sale-General Dentistry practice. Gross Receipts $414K. Practice has been operated by the same owner for the past 6 years. Leased 950 sq. ft. office with 3 equipped operatories. Dentix software, Intra-Oral camera, Panoramic X-Ray. Owner to relocate.
- **SAN DIEGO:** *For Sale*-General Dentistry Practice. 6 ops, Intra-Oral camera, Eagle Soft Software. Office square feet 2,300 with 3 years remaining on lease. 2009 Gross Receipts $1,448,520, with an adjusted net income of $545K. Doctor would like to phase out then retire. #14331
- **SAN DIEGO/CITY HEIGHTS:** For Sale-General Dentistry practice. Owner has operated in same location for 12 years. Approx. 1,000 active patients, Panoramic X-ray, Intra-Oral camera, in this 3-chair office. #14321
- **SANTA BARBARA:** *For Sale* - General Dentistry Practice. This excellent practice's 2009 gross Receipts $891K with steady increase every year. Practice has 6 days of hygiene. 1,690 sq. ft., 5 ops, Laser, Intra-Oral camera, Schick Digital X-Ray, Datacon software. Doctor has been practice in same location for the past eleven years of his 31 years in Santa Barbara. Doctor is retiring. #14333
- **SOUTH LAKE TAHOE:** *For Sale*-General Dentistry Practice. 2007 collections $534K. Office is [illegible] sq. ft. with 3 ops. Practice has been in its present location for the past 26 years. Owner to retire.
- **TORRANCE:** For Sale- General Dentistry Practice: Owner has operated in same location for 20 years. Approx. 1,000 active patients, 1,080 sq. ft., Brican System, and Camsight software in this 2 equipped, 3 available-chair office. 2009 Gross receipts $434K with 38% overhead. Owner relocating. #14320
- **TRACY:** For Sale- Equipment, furnishings, and leaseholds only. In the Central Valley. Fully equipped including 4 Belmont Accutrac chairs, 2 Midmark chairs, 6 DCI rear delivery units, 3 Gendex X-ray units, 1 Soridex digital x-ray processor, 1 Statim 5000, 1 Harvey autoclave. 2,800 sq. ft., 6 Ops. New lease available from landlord. #14335
- **VISALIA:** For Sale- General Dentistry Practice. Gross Receipts $616K with an adjusted net income of $ 321K. Office is 1,380 sq ft with 3 equipped operatories, Intra-Oral camera, Digital X-Rays, Mogo software, equipment & leaseholds look new. 5 years in present location. Owner to relocate. #14347

CALIFORNIA / NEVADA REGIONAL OFFICE

HENRY SCHEIN PPT INC.
California Regional Coporate Office
DR. DENNIS HOOVER, Broker
Office:(800) 519-3458 Office (209) 545-2491
Fax (209) 545-0824 Email: dennis.hoover@henryschein.com
5831 Stoddard Road, Ste.808 Modesto, CA 95356

Henry Schein PPT Inc., Real Estate Agents
and Transitions Consultants
Dr. Tom Wagner (916) 812-3255 N. Calif. Mario Molina (323) 974-4592 S. Calif.
Hallie Johnson-Nelson (209) 545-2491 N. Calif. Thinh Tran (949) 533-8308 S. Calif.

CLASSIFIEDS, CONTINUED FROM 186

SEEKING MANAGING DENTISTS — If you're looking for a long-term commitment and desire to be productive, the opportunity is yours! Seeking FT managing dentists to join large group practice in Lancaster, Palmdale, Los Angeles, Orange County, Inland Empire, San Diego and any doctors looking to relocate to Arizona. Steady patient flow in high volume HMO environment. Must have 3-5 years experience and be proficient in molar endo RCT. A comprehensive benefits package is offered including malpractice coverage. Competitive pay! For available positions please call: 714-428-1305, submit your resume to: kristin.armenta@brightnow.com or fax to: 714-460-8564.

OPPORTUNITIES WANTED

IN HOUSE PERIODONTIST/IMPLANT SURGEON AVAILABLE FOR YOUR PRACTICE — In the Greater San Francisco Bay Area. Implant Surgeon/Bone Grafting/Perio Surgery/3rd Molar Extractions. E-mail bayareaperio@gmail.com or call 617-869-1442.

PART-TIME DENTIST/HYGIENIST — Ethical, experienced, kind, available to assist your practice in a time of need or prosperity. Covering Orange County and San Diego. Contact Ed 949-973-1018 or kksfwz@gmail.com.

PRACTICES FOR SALE

GENERAL PRACTICE IN EL CAJON/SAN DIEGO FOR SALE — Mainly cosmetics, C&B, implants. No pedo, no HMOs. All PPOs and cash. Collected over $650K in the last three consecutive years. Reduced price from $525K to $395K. Buy directly from owner. Options of long term-lease or buy the building as well. Call 619-401-0444.

SANTA CRUZ PRACTICE FOR SALE — General practice of 30+ years. Fee for service. Please respond to gadwalldds@gmail.com.

STOCKTON PRACTICE FOR SALE — Visible and easily accessible 1,100 sq. ft. practice. Ideal opportunity for a dentist looking to start a practice or for someone looking to expand. Great location, next to shopping. Equipment/charts included. Buyer would take over building lease. Selling dentist is retiring. Contact 209-957-0765 or 209-598-1640.

LEE SKARIN AND ASSOCIATES

Dental Practice Sales

QUESTIONS MOST OFTEN ASKED BY . . .

. . . SELLERS

1. Can I get all cash for the sale of my practice?
2. If I decide to assist the Buyer with financing, how can I be guaranteed payment of the balance of the salesprice?
3. Can I sell my practice and continue to work on a part-time basis?
4. How can I most successfully transfer my patients to the new dentist?
5. What if I have some reservation about a prospective Buyer of my practice?
6. How can I be certain my Broker will demonstrate absolute discretion in handling the transaction in all aspects, including dealing with personnel and patients?
7. What are the tax and legal ramifications when a dental practice is sold?

. . . BUYERS

1. Can I afford to buy a dental practice?
2. Can I afford not to buy a dental practice?
3. What are ALL of the benefits of owning a practice?
4. What kinds of assets will help me qualify for financing the purchase of a practice?
5. Is it possible to purchase a practice without a personal cash investment?
6. What kinds of things should a Buyer consider when evaluating a practice?
7. What are the tax consequences for the Buyer when purchasing a practice?

Lee Skarin & Associates, Inc.
Offices
CA DRE #00863149
(805) 777-7707
(818) 991-6552

1800-SKARIN#1
1-800-752-7461

LEE SKARIN & ASSOCIATES gives straightforward answers to these important questions as well as others you may have – by phone or in person – **without obligation!**

Lee Skarin & Associates have been successfully assisting Sellers and Buyers of Dental Practices for nearly 30 years in providing the answers to these and other questions that have been of concern to Dentists.

Call at anytime . . . for a no obligation response to any or all of your questions.
GO AHEAD AND CALL – **IT'S PAINLESS!**

LEE SKARIN AND ASSOCIATES

CDA JOURNAL, VOL 39, Nº3

ADVERTISER INDEX

A. Lee Maddox, A Professional Law Corporation	maddoxpracticegroup.com	130, 134
California Practice Sales	calpracticesales.net	184
Carroll & Company Practice Sales	carrollandco.net	188
CDA Practice Support Center	cdacompass.com	156–157
D&M Practice Sales and Leasing	dmpractice.com	190
DOCS Education	docseducation.org	131
Golden State Practice Sales	925-743-9682	186
Implant Direct	implantdirect.com	133
Lee Skarin and Associates, Inc.	leeskarinandassociates.com	191
Maddox Practice Group	maddoxpracticegroup.com	134
Midwest Dental	midwest-dental.com	166
Nevada Dental Assocation	nvda.org	182
Professional Practice Sales of the Great West	415-899-8580	183
Professional Practice Transitions	pptsales.com	189
Select Practice Services, Inc.	betterobin.com	195
The Dentists Insurance Company	tdicsolutions.com	126, 136
TOLD Partners, Inc.	told.com	185
Ultradent Products	ultradent.com	196
Western Practice Sales/John M. Cahill Associates	westernpracticesales.com	161, 179, 187
Wood and Delgado	dentalattorneys.com	186

FOR ADVERTISING INFORMATION, PLEASE CONTACT COREY GERHARD AT 916-554-5304.

DR. BOB, CONTINUED FROM 194

insatiable appetite for ticonium. Unlike dogs who disdain anything without acrylic saddles, preferably bilateral distal extensions, Clifford goes for the ticonium castings, but will take nobilium in a pinch even though his owner states it gives him (Clifford) gas.

■ A dentist in Carlton, Ohio, was fined $50 and court costs in 1883 for leaving the rugae off a denture he had made. The plaintiff claimed he had trouble with his sibilants, which resulted in his being called "Percy" by his peer group. He also ran afoul of Ohio laws which made lisping in a public place a felony punishable by hanging.

■ This month marks the 100th anniversary honoring the flight of Rupert Icarus, DDS, of Dihedral, Maine. Icarus made quite a splash in 1888 when he launched himself from the second story of his office/home wearing a pair of wings he had constructed from rice paper and sticky wax. Predictably, as he neared the sun, the sticky wax softened and he augured in, destroying whatever chance he had of becoming an ADA Life Member.

■ Because of his early experiments with the Roentgen ray, during which he claimed he could "see right through human flesh," Dr. Heinrich Blaupunkt was declared a warlock by the town council of Salem, Mass. He was saved from burning at the stake when it was revealed he was the only dentist in town. Elected secretary-treasurer of a local coven, Blaupunkt rose rapidly in the ranks, becoming a delegate to the whole Northeastern Regional Coven until his untimely death at age 89 when his broom collided with a carriage that had run a red light.

■ Finesa Otterbein, dental assistant to Seymour B. Paddleford, DDS, of Apollonia, Wis., became, in 1951, the first dental assistant on record to disengage a patient's entire tongue from its moorings with her high velocity vacuum tip. Mrs. Otterbein later modestly denied that there was anything special in her feat, but the tongue, with an appropriate plaque, now resides in the Archives of the Harvard Medical School.

■ Although Dr. Robert J. Nelsen is generally recognized as the inventor of the first commercially successful high-speed handpiece, little is known about some earlier experiments done by Santos M. Gerbil, DDS, of Ptarmigan Falls, N.M., during 1946-47. Dr. Gerbil had come into possession of an Allison engine from a war surplus P-40 during one of his forays into a local Goodwill store. He subsequently coupled this to a rather large compressor he had "liberated" from a Nazi submarine base at Bremerhaven during his tour there with the Occupation Forces. With these components, he had assembled a crude handpiece capable of 1,700,000 rpm. Gerbil estimated he could prepare a full-mouth rehab case with his new handpiece in just a little over 3½ minutes. "Trust me," he chided his apprehensive patient, "I'm a doctor." Fortunately, or unfortunately, as case may be, in a preop test, a blade from the turbine flew off, knocking a hole 4-by-6 feet in the side of his operatory.

Promising, should he remain implacable, to clap the darbies on him and cart him off to the local Bastille, authorities in Ptarmigan Falls finally persuaded Dr. Gerbil to abandon his attempts. Otherwise, the history of the high-speed handpiece would be quite another story from the one we know now. ■■■■

CDA JOURNAL, VOL 39, Nº3

Nothing Trivial About Dental Trivia

A goat named Clifford residing on a small farm outside Wilkes-Barre, Pa., has been discovered to have an insatiable appetite for ticonium.

➔ Robert E. Horseman, DDS

ILLUSTRATION BY DAN HUBIG

This is Dental Appreciation Month although you'd never know it from the lay press. The media have given it the same attention accorded to the late, lamented Millard Fillmore Day that never got off the ground either. Within the profession, however, Dental Appreciation Month is still alive and serving to remind us each year of the people and events that make dentistry such an exciting and fulfilling life. Some facts gleaned from this year's celebration:

■ Thomas E. Dewey, who ran an unsuccessful presidential race against Harry Truman in 1948, lost because of a diastema between his upper centrals that he attempted to hide with a large mustache. Plagued since early childhood when he was often compared with Alfred E. Neuman of *MAD* magazine, Dewey elected to postpone fixing his gap until 1982 when diastema closure became de rigueur. Unfortunately, he died in 1971 before this plan could be implemented.

■ A bill that would make possession of a diastema a misdemeanor except during the last two days of October, has been stalled in committee, but proponents of the bill have announced the availability of bumper stickers and buttons with the customary red bar slashing diagonally over a representation of upper anteriors with centrals agape. Dentists aggrieved over some patients' lack of concern with their diastemas, patients who, in fact, flaunt them, cheer this announcement and vow not to give up the fight until this affront to esthetics is wiped from Earth.

■ A goat named Clifford residing on a small farm outside Wilkes-Barre, Pa., has been discovered to have an

CONTINUES ON 193

When you want your practice sale done right.

BetteRobin, DDS, JD

DENTIST ATTORNEY BROKER

Loma Linda Dental 83 Southwestern Law 95

Select Practice Services, Inc.
Dental Practice Sales and Transitions
877.377.6246 • www.BetteRobin.com
17482 Irvine Blvd., Ste E • Tustin, CA 92780

Introducing unit dose Opalescence!

Opalescence™

Oh!™

Oh! That's Easy!
Oh! That's Brilliant!
Oh! That's Opalescence!

CALL FOR A
FREE
SAMPLE
800.552.5512
Promo code 11C04
Offer expires 3.31.11

ULTRADENT PRODUCTS, INC
Improving Oral Health Globally

WHITEN

www.ultradent.com | 800.552.5512