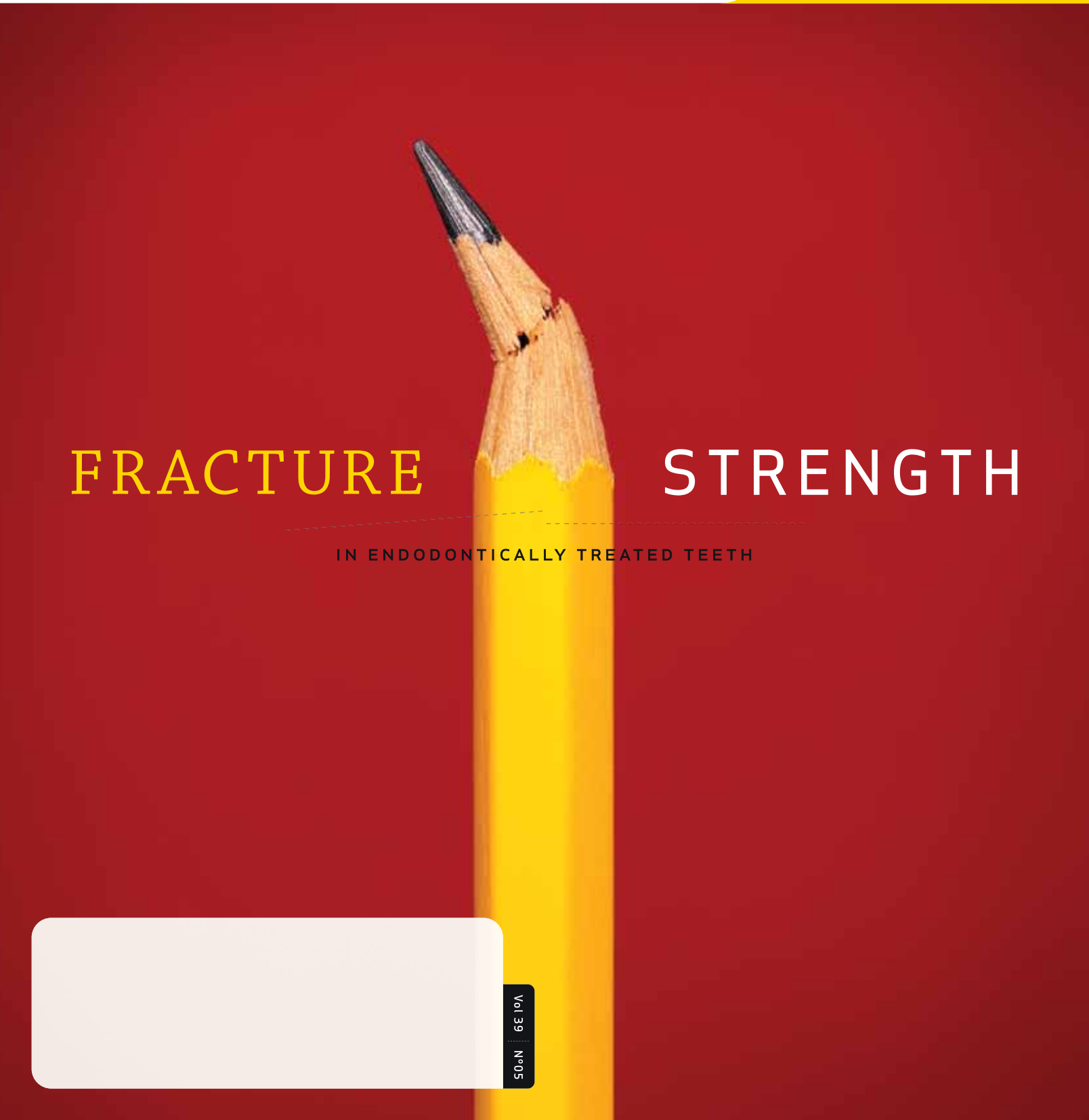
OF THE CALIFORNIA DENTAL ASSOCIATION

Journal

MAY 2011



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IN ENDODONTICALLY TREATED TEETH

Vol 39 No05

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CDA JOURNAL, VOL 39, Nº5

DEPARTMENTS

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FEATURES

OF THE CALIFORNIA DENTAL ASSOCIATION

Journal

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JULY: *Barriers to Care*
AUGUST: *Dental Labs*

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CDA JOURNAL, VOL 39, Nº5

MICRA Managing

BRIAN SHUE, DDS

Imagine California arriving at a crossroads that would negatively impact every citizen with across-the-board consequences. That is what happened more than 35 years ago when runaway medical malpractice lawsuits and jury awards left California with an unstable insurance market and skyrocketing liability premiums, creating a medical malpractice insurance crisis.

The operating costs of providing health care became so prohibitive that many physicians left the state or closed up their businesses, including obstetricians and those practicing in rural communities. Something had to be done to prevent this Golden State exodus and save the hospitals and clinics which, as safety net providers, operated with fragile budgets in a balance akin to tightrope walkers without a net.

Against those insurmountable odds, California made it through that difficult time with legislation called the Medical Injury Compensation Reform Act (MICRA).

A bipartisan California Legislature passed MICRA and it became law in 1975. It brought historical tort reform that even today remains a model for the United States, according to the American Medical Association and the American Hospital Association.

MICRA succeeded because it aimed to protect patients' rights in the court of law, control health care costs, preserve access to higher-risk professions like obstetricians and neurosurgeons, while keeping doctors in practice and clinics and hospitals solvent. This landmark statute accomplished much to protect the patient against those found liable: no limit to economic damages for all past and future medical costs, no limit to economic damages for lost wages, lifetime earning potential and for any other conceivable economic loss, and no limit to punitive damages. It also limited speculative noneconomic damages (pain and suffering awards) to $250,000.[1]

Such costs have enormous impact on the way health care is provided.

This type of reform still remains elusive in many states. For example, an OB/GYN doctor in Los Angeles or Orange County only paid $89,853 annually for professional liability insurance (as of 2009), but that same doctor would have to pay $191,422 annually in liability premiums to practice in Dade County, Fla., or a whopping $194,935 per year to practice in Nassau or Suffolk county in New York.[2]

Such costs have enormous impact on the way health care is provided. Recently, the U.S. Congressional Budget office estimated direct medical liability costs total $35 billion annually, or about 2 percent of total health care expenditures. This cost included insurance premiums, settlements, awards, and noncovered administrative costs.[3]

There is the additional concern about the practice of defensive medicine — sometimes described as "looking over one's shoulder" — which are health care procedures performed as a safeguard against possible future litigation. An independent study reports that health care malpractice costs, including defensive medicine, totals an estimated $55.6 billion annually.[4]

Protecting MICRA from any change is important. That is why Californians Allied for Patient Protection (CAPP), with its mission, "to protect access to care and patient safety through California's landmark MICRA," is vital to our state.

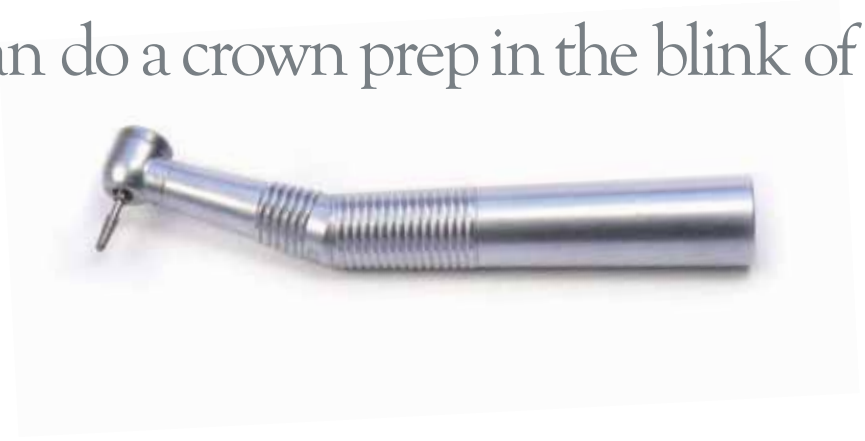
Lisa Maas, CAPP executive director, recently discussed the enormous successes accomplished by MICRA at a recent CDA Board of Trustees meeting. Maas, no stranger to us, served 15 years as chief legal officer and a vice president for CDA and TDIC before joining CAPP. Between 1976-2007, United States premiums (including California) increased 885 percent or an amount more than $11.5 billion, while California premiums in the same time period increased 300 percent, or by $1 billion, Maas said.

According to CAPP, on an individual basis, dentists who work in states without medical liability reform pay more for liability insurance. As examples, Arizona and Nevada are states without medical liability tort reform. Based on a professional liability policy with $1 million limits, general dentists in Arizona and Nevada pay rates that are up to 30 percent and 22 percent higher, respectively, than California dentists. For oral and maxillofacial surgeons who practice in Arizona and Nevada, their rates are up to 37 percent and 20 percent higher, respectively, than those who practice in California.

CAPP is supported by more than 400 groups, including CDA, TDIC, every California component dental society, the California Medical Association, the California Hospital Association, Planned Parenthood, community clinics, hospitals, firefighters, nurses, business groups, local governments, and other liability carriers. Peter DuBois, CDA's executive director,

CONTINUES ON 288

You can do a crown prep in the blink of an eye.



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ASSOC. EDITOR, CONTINUED FROM 285

currently is CAPP's chair and also serves on the CAPP executive committee and CAPP board of directors.

However, the solid work CAPP does to protect patients, our health profession, and California as a whole, is not done. With the noneconomic damages for "pain and suffering" set at $250,000, Maas reported that the lobbying organization representing California's personal injury lawyers may introduce legislation that would change the limit. An increase of this noneconomic damages cap would potentially increase liability insurance lawsuits, lead to increased premiums, increase the cost of health care, and put access to medical care at risk.

Maas said there have been challenges to MICRA in the past, specifically directed at the noneconomic damages provision. "A change will make it easier and more lucrative for them to file lawsuits alleging negligence against doctors, hospitals, and health care providers," she said. "A recent study found that doubling MICRA's cap could cost consumers and taxpayers in California $9.5 billion a year in higher health care costs."

President Barack Obama is also concerned about high health care costs related to malpractice liability. At the 2011 State of the Union Address, he stated his concern about the cost of health care at the federal level: "I'm willing to look at other ideas to bring down costs, including . . . medical malpractice reform to rein in frivolous lawsuits." According to the U.S. Congressional Budget Office, if tort reform occurred — including a $250,000 cap on noneconomic damages that is not present in about two-thirds of the states — it "would reduce mandatory government spending on health care programs "by roughly $41 billion over the next 10 years."[3]

However, personal injury lawyers want to quadruple the noneconomic cap in California to at least $1 million. Facing another medical malpractice insurance crisis would be a threat of enormous proportions. Just ask the more than 1,000 doctors who moved out of California or closed up shop during the last crisis. It is clear the work at CAPP is far from over.

For more information about CAPP and MICRA, go to micra.org. ■■■■

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The *Journal of the California Dental Association* welcomes letters. *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*, the author certifies that neither the letter nor one with substantially similar content under the writer's authorship has been published or is being considered for publication elsewhere, and the author acknowledges and agrees that the letter and all rights of the author with regard to the letter become the property of the California Dental Association.*

CDA JOURNAL, VOL 39, Nº5

Reader: Spotlight, Dog in the Practice Are 'Unacceptable'

I am responding to the "Impressions" article in the *Journal of the California Dental Association* (39[3]:137-9, March 2011) regarding the "Pooch in the Practice." I was not surprised that someone would actually try having their dog in the operatory for anxiety control, what was shocking was the *Journal* would give such a glowing endorsement of the practices the article describes. Given the infection control laws, legal liability, and moral and professional obligations, which we struggle to comply with on a daily basis, these practices hardly seem to comply with the letter or the spirit of said obligations. Anything short of running "Mona Lisa" the dog through the autoclave between each patient is unacceptable and, therefore, these practices should not be fawned upon by a *Journal* article.

RICHARD P. SCHIENBAUM, DDS
Culver City, Calif.

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CDA JOURNAL, VOL 39, Nº5

Matt Mullin

Campaign Under Way for Tobacco-Free Baseball in Major League Parks

With the boys of summer ready to hit the field, 10 major public health and medical organizations are asking the Major League Baseball Players Association and Major League Baseball to prohibit tobacco use by managers, coaches, players, and staff at all major league ballparks.

The campaign features a new website, tobaccofreebaseball.org, and has social media tools to help fans tell MLB, teams, and players to "Knock Tobacco Out of the Park." (In 1993, minor league baseball banned tobacco and National Hockey League followed suit.)

The American Academy of Pediatrics, American Cancer Society, American Dental Association, American Heart Association, American Lung Association, American Medical Association, Campaign for Tobacco-Free Kids, Legacy,

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Retaining Wisdom Teeth Could Be More Detrimental Than Previously Thought

Recent evidence-based research has confirmed the long-held belief that it is indeed wise to remove wisdom teeth during adulthood as it not only improves dental and oral health, but also may reduce the risk illness later in life, according to studies from American Association of Oral and Maxillofacial Surgeons (AAOMS), surgeons, and academics.

Even when wisdom teeth are not diseased or symptomatic when they come into the oral cavity, their position and location in the mouth makes them difficult to keep clean and supports the accumulation and spread of harmful bacteria that can lead to more serious conditions later in life, according to a news release. Additionally, the local and systemic health implications of asymptomatic wisdom teeth are far broader than previously thought.

Key finding in the study include:

- An absence of symptoms does not equal the absence of disease;
- Eighty percent of young adult subjects who retained previously healthy wisdom teeth had developed problems within seven years;
- Extracting wisdom teeth in young adults produces less pain and shorter healing times than in older patients;
- Monitoring retained wisdom teeth may be more expensive than extraction over a lifetime; and
- An estimated 60 percent of patients with asymptomatic wisdom teeth prefer extraction to retention.

CDA JOURNAL, VOL 39, Nº5

"These patients' mouths are as dry as if you've closed the faucet, and we want to turn that faucet back on."

STEPHEN HSU, PHD

Newly Developed Lozenge May Help Treat Xerostomia

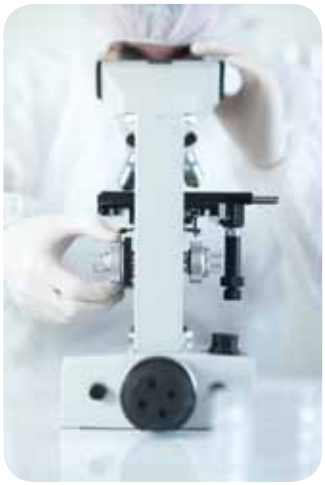
An all-natural lozenge to help treat individuals with xerostomia may be available to the public in the coming months. A clinical trial currently is under way at Georgia Health Sciences University College of Dental Medicine.

"These patients' mouths are as dry as if you've closed the faucet, and we want to turn that faucet back on," said Stephen Hsu, PhD, molecular and cell biologist and co-investigator of the study. "The cells and glands that produce saliva are still there, they're just not working."

Xerostomia affects about 40 percent of American adults. Through previous animal studies and human sample testing, GHSU researchers found that dry mouth involves salivary gland inflammation, fewer antioxidants and elevated markers for abnormal growth, and DNA damage caused by free radicals, according to a news release. Green tea contains polyphenols, which are strong antioxidants, and reduce that damage to the salivary gland.

"With green tea polyphenols, we have an agent that's helping to correct the salivary gland's abnormal behavior," said Douglas Dickinson, PhD, associate professor in the Department of Oral Biology and co-investigator.

In addition to the lozenge containing green tea polyphenols, it also contains xylitol and jaborandi leaf extract. The slow, extended release that remains in the mouth contrasts the systemic effect caused by dry mouth prescription medications that can cause profuse sweating and diarrhea, said Scott De Rossi, DMD, chairman of the Department of Oral Health and Diagnostic Sciences and principal investigator.



Researchers Find Protein Linked to Neck and Head Cancer

University of Michigan School of Dentistry researchers have discovered that when they inhibited the expression of a protein in oral cancer cells in a petri dish, those cells did not proliferate and more of them died. This finding may give new optimism to individuals suffering from aggressive, localized forms of head and neck cancer.

What's more, when researchers suppressed the protein, SIRT3 or Sirtuin-3, in the cancer cells and combined that with radiation or chemotherapy treatment, the prohibitive effect on cancer cells was even greater, said Yvonne Kapila, associate professor of dentistry and lead author of the study, according to a news release.

Kapila, whose research team began looking at the Sirtuin group of proteins because some studies suggest they are key regulators for cell integrity and survival, said mice that were injected with SIRT3-inhibited oral cancer cells had a 75 percent reduction in tumors compared to the mice injected with regular oral cancer cells.

"We thought that maybe cancer cells, because they are very crafty, may also use one of these proteins to their advantage to extend their own survival," said Kapila. "With oral cancer, often the problem is the difficulty of early detection, thus when diagnosed at a late stage the cancer becomes very aggressive. If one can find a way to tailor treatments to those aggressive situations obviously you have a far better case of survival."

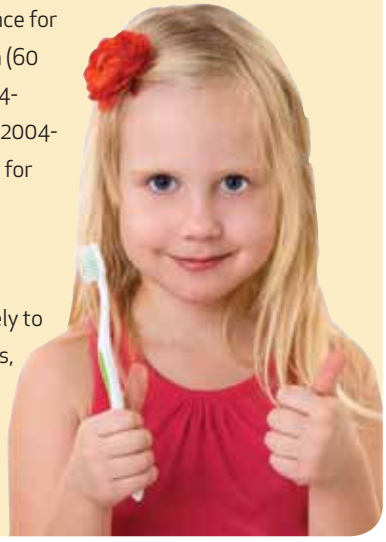
The eighth most common cancer in the world, oral cancer, as well as oral squamous cell carcinoma accounts for 90 percent of all malignancies. The five-year survival rate for patients with oral squamous cell carcinoma is 34 percent to 62.9 percent, according to the study. Kapila also commented that oral cancer survival rates haven't changed in decades, so there's a great desire in the scientific community to find more effective treatments.

Some research has shown that SIRT1 and SIRT3 proteins may suppress, rather than support, tumor growth, so it's important to remember that each case is different, said Kapila.

Children's Oral Health Data Now Available

Recent data on untreated caries, the prevalence of caries, and sealant use now is available on the National Oral Health Surveillance System.

Information from 13 states that conducted recent basic screening surveys is included in this post. Participating states were Arkansas, Arizona, Michigan, Minnesota, Mississippi, Nevada, New Hampshire, North Dakota, Ohio, Oklahoma, South Dakota, Virginia, and Washington. Of interest are increases in the prevalence of dental sealants in four of these states: Arizona (47 percent prevalence among third-grade schoolchildren for the 2009-2010 school year, previously 36 percent for 1999-2002); New Hampshire (60 percent prevalence for the 2008–2009 school year, previously 43 percent for 2003-2004); North Dakota (60 percent prevalence for the 2009-2010 school year, previously 53 percent for 2004-2005); and Ohio (50 percent prevalence for 2009-2010, previously 43 percent for 2004-2005), according to a news release that also said Minnesota reported 64 percent for sealant prevalence (2009-2010).



One of the most rampant chronic childhood disease in the United States, 90 percent of tooth decay is located on chewing surfaces of the posterior teeth, particularly molars. A number of states provide low-income children, who are likely to receive private dental care through school-based sealant programs, with sealants, and with good results. For example, children receiving dental sealants in school-based programs have about 60 percent fewer new decayed pit and fissure surfaces in the back teeth for up to 2 to 5 years after a single application.

Venus White Pro

Venus White Pro, the popular mint-flavored tooth whitening gel by Heraeus Kulzer, LLC, is now available in 35 percent carbamide peroxide strength for enhanced whitening yet shorter wear times. The gel can be worn in custom trays for just up to 30 minutes a day. For more information, (800) 431-1785, or go to SmileByVenus.com.

BASEBALL, CONTINUED FROM 291

Oral Health America, and Robert Wood Johnson Foundation are the 10 organizations backing the campaign. The chief executives of this group urged for a tobacco ban to become effective in 2012 following the negotiating of the collective bargaining agreement this year.

"Use of smokeless tobacco endangers the health of Major League ballplayers. It also sets a terrible example for the millions of young people who watch baseball at the ballparks and on TV and often see Major League players and managers using smokeless tobacco," said the groups.

News stories have chronicled the struggles coaches and players have had in quitting tobacco. Among the vocal are Josh Hamilton, Most Valuable Player award winner for the American League; World Champion San Francisco Giants manager Bruce Bochy; and Washington Nationals pitcher Stephen Strasburg. Additionally, Hall of Famer Tony Gwynn's recent cancer diagnosis and his public comments attributing his disease to years of chewing tobacco have underscored the health threat from smokeless tobacco, according to a news release.

The plea for a tobacco ban in MLB venues and by all those associated with it is not without reason. Smokeless tobacco use is on the rise among high school boys. An estimated 36 percent increase has been seen since 2003 and 15 percent of that same age group currently use smokeless tobacco, according to figures from the Centers for Disease Control and Prevention.

To read the letter to Major League Baseball and the Major League Baseball Players Association, go to tobaccofree-baseball.org/resources_letter.pdf.

"Use of smokeless tobacco endangers the health of Major League ballplayers."

University administrators, professionals from the dental and medical fields, as well as political leaders, opened the new campus of the Laguna Honda Hospital and Rehabilitation Center in San Francisco.

Dental Clinic, Hospital Unveil New Facility

The much-anticipated opening of the dental clinic at the new campus of Laguna Honda Hospital and Rehabilitation Center in San Francisco was celebrated recently as scores toured the facility. The clinic features new equipment and technologies to care for those with restrictive mobility and those individuals with cognitive and physical disabilities, as well as continues to offer oral surgical procedures, prosthetic dentistry, and other comprehensive services.

Since 2004, the Arthur A. Dugoni School of Dentistry has been the lead provider of dental services at Laguna Honda and will continue to do so in the new facility.

"Our partnership with Laguna Honda allows us to access a population of patients that does not readily access dental care," said Elisa Chavez, DDS, Laguna Honda dental program director. "We have an interdisciplinary team here who is committed not only to excellent patient care but also to educating our students, the future health care providers."

Dental faculty and staff function as a part of the hospital's interdisciplinary team, working closely with physicians, nurses, social workers and other hospital staff to coordinate care, according to a news release. More than half of the Dugoni School student body rotates through the Laguna Honda dental clinic for five weeks in their final year as part of their educational and clinical experience.

"The new Laguna Honda is a modern, efficient facility that is second to none," added Gene LaBarre, DMD, MS, dental school faculty member and host of the clinic reception. "This event gave us an opportunity to celebrate the new facilities and to show how they are used in providing comprehensive oral health care for residents."

Gluma Desensitizer PowerGel ↑

Gluma Desensitizer PowerGel, by Heraeus, is the new one-step gel formula desensitizer that allows for accurate control and placement to reduce or eliminate dentinal hypersensitivity. The new Gluma Desensitizer PowerGel delivers the same level of desensitization as Gluma liquid but also offers better handling, easier control, and greater accuracy. For more information, go to heraeus-kulzer.com or call 800-431-1785.

UPCOMING MEETINGS

2011

May 12–14	*CDA Presents the Art and Science of Dentistry,* Anaheim, 800-CDA-SMILE (232-7645), cdapresents.com.
June 9-12	Cleft 2011 International Cleft Lip and Palate Conference, San Francisco, cleft2011icpf.org.
June 16–18	ADA New Dentist Conference, Chicago, 800-621-8099, ext. 2779, ada.org/goto/newdent.
Sept. 11-14	FDI Annual World Dental Congress, Mexico City, www.fdicongress.org. Please also view this related video: http://www.youtube.com/watch?v=3N4okaVMYhs.
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

NATASHA A. LEE, DDS

Digital Impressions' Clinical Accuracy Tested

Syrek A, Reich G, et al, Clinical evaluation of all-ceramic crowns fabricated from intraoral digital impressions based on the principle of active wavefront sampling. *J Dent* 38(7):553-9, July 2010.

PURPOSE: To evaluate the fit of all-ceramic crowns manufactured from intraoral digital impressions and compare those restorations with the fit of all-ceramic crowns made from conventional two-step silicone impressions.

METHODS: Twenty participants had a tooth prepared for a Lava (3M ESPE) all-ceramic crown. The prepared teeth were scanned using the Lava Chairside Oral Scanner and impressions of the same teeth were taken with silicone impression material. Lava crowns were then fabricated using both impression techniques and two examiners conducted blind evaluation of the fit of the restorations prior to cementation.

RESULTS: The marginal gap was compared between the crowns fabricated from both techniques and it was found that the median marginal gap of the crowns made using the digital oral scanner was 49 microns compared to a median marginal gap of 71 microns for crowns fabricated from the conventional impressions. It was found that the crowns made from the digital oral scanner also tended to have better fit at the interproximal contacts although occlusion was similar in both groups.

CONCLUSIONS: In this study, the overall fit of crowns made from the Lava Chairside Oral Scanner fit significantly better than those fabricated from conventional silicone impressions.

RELEVANCE: When making decisions about incorporating new technology into practice, dentists should determine whether the technology offers improved efficiency, is more cost-effective, or improves overall clinical outcome. In this example, the use of digital impressions was shown to meet the integration criteria of greater clinical accuracy and possibly greater efficiency due to ease of optical impression taking and a lesser need for adjustments during crown delivery.

ENDODONTICS

W. CRAIG NOBLETT, DDS, MS, FACD

Performing Treatment in Multiple Visits Will Not Decrease the Chance of Postoperative Pain

El Mubarak A, Abu-Baker N, Ibrahim Y, Postoperative pain in multiple-visit and single-visit root canal treatment. *J Endod* 36(1):36-9, 2010.

AIM: The purpose of this prospective clinical cohort study was to evaluate postoperative pain with respect to the number of visits required to complete endodontic treatment.

METHODS: A total of 234 patients were included in this study and pretreatment questionnaires were completed regarding presenting symptoms. Chemomechanical preparation of the root canals and obturation technique were standardized for all patients. Patients were asked to complete a pain questionnaire using a visual analog scale with defined categories: 1 = no pain, up to 4 = pain not relieved by analgesics. The subjects were asked to give a score at 12 and 24 hours after treatment. Data were analyzed by chi-square test.

RESULTS: There was no significant difference in the incidence of pain between patients treated in a single visit or multiple visits. The incidence of any postoperative pain was low at 15.9 percent and was most closely associated with those patients presenting with pretreatment pain and in teeth with a diagnosis of necrotic pulp.

CONCLUSIONS: The number of visits had no influence on the incidence of postoperative pain. The main predicting factors of postoperative pain were preoperative pain and a necrotic pulp.

CLINICAL RELEVANCE: Completion of treatment in a single visit does not increase the chance of postoperative pain. The presence of preoperative pain is a strong predictor of postoperative pain, and this is consistent with almost every prospective study on postendodontic treatment pain. Performing treatment in multiple visits will not decrease the chance of postoperative pain.

CDA JOURNAL, VOL 39, Nº5

PEDIATRICS

THOMAS S. TANBONLIONG JR., DDS

3M Paste and Vitapex Use in Primary Molars

Nakornchai S, Banditsing P, Visetratana N, Clinical evaluation of 3Mix and Vitapex as treatment options for pulpally involved primary molars. *Int J Paedtr Dent* 20(2):214-21, May 2010.

PURPOSE: The purpose of this prospective, single-blinded clinical trial was to compare the clinical and radiographic success of 3Mix (paste mixture of ciprofloxacin, metronidazole, and minocycline) and Vitapex for root canal treatment of poor prognosis primary molars.

MATERIALS AND METHODS: A sample size of 50 poor prognosis primary molars were included. Group 1 was treated with 3Mix Paste with noninstrumental endodontic treatment. After access with a high-speed fissure bur, the necrotic pulp tissue was removed by a spoon excavator and irrigated with 2.5 percent sodium hypochlorite. The 3Mix paste was placed in the orifices of the canal as soon as hemostasis was obtained. Glass ionomer cement was used to fill the rest of the pulp chamber. Group 2 was treated with Vitapex (control). Total canal instrumentation with K files and copious irrigation with sodium hypochlorite was used. Vitapex was filled in directly by a prepackaged syringe. IRM was used to fill the rest of the chamber. All of the teeth were restored with stainless-steel crowns. The teeth were evaluated at six and 12 months by two blinded examiners.

RESULTS: Twenty-five teeth were assigned to each group. At six months, both groups showed 100 percent clinical success. After 12 months, one tooth in each group presented with gingival abscess. Regarding clinical success, no difference was found between two groups. Radiographic success: After six and 12 months, no statistically significant differences were found between the two groups (P=0.356 and 0.068, respectively). Two teeth treated with 3M paste showed internal root resorption after six months. At 12 months, these teeth showed calcification in the resorption area. The internal resorptions were confined to the tooth and did not show any clinical signs.

CONCLUSION: Both 3M paste and Vitapex can be used as a root canal treatment agent in pulpally involved primary teeth.

REVIEWER'S COMMENT: The advantage of using 3M paste is the elimination of canal instrumentation. Root canals of primary teeth are very difficult to instrument due to its anatomy. However, more studies have to be done to determine if there are any long-term effects of 3M paste on the succedaneous tooth and its surrounding tissues .

ORTHODONTICS

GLENN SAMESHIMA, DDS, AND SAMUEL LEE, DDS

Root Resorption and Orthodontic Treatment

Weltman B, Vig KWL, et al, Root resorption associated with orthodontic tooth movement: a systematic review. *Am J Orthod Dentofacial Orthop* 137(4):462-76, April 2010.

AIM: To systematically review root resorption (RR) in patients who had orthodontic tooth movement. This knowledge can assist in clinical decision making to minimize the risks and severity of root resorption.

METHOD: Electronic databases were searched, nonelectric journals were hand-searched, and no restrictions were placed on year, publication status, or language of trials. Inclusion criteria included: randomized clinical trials involving human subjects for orthodontic tooth movement, with fixed appliances. Root resorption was recorded either during or after treatment.

RESULTS: Thirteen articles describing 11 trials fulfilled the criteria for inclusion. Acar found that teeth experiencing orthodontic tooth movement had significantly more RR than control teeth also continuous forces produced significantly more RR than discontinuous forces. Chan and Darendeliler found that heavy forces produced significantly more RR than lighter forces. Barbagallo also found that heavy forces had significantly more RR than light forces. Han found intrusive force increased the percentage of resorbed area fourfold. Mandall found no significant differences in RR between different archwire sequences. Levander found lower RR in patients treated with a pause (two to three months) than those with continuous treatment. Brin showed that incisors with either clinical signs or patients indicating trauma had the same prevalence of oderate to severe orthodontically induced inflammatory RR (OIIRR) as those without trauma. Brin also found that unusual morphology of teeth had no increased likelihood of OIIRR than normal root shapes. Brin found no statistical difference in OIIRR between two-phase and one-phase orthodontic treatment. Scott, in his study of the Damon 3 self-ligating appliance versus conventional brackets, found no statistical significant difference in mandibular incisor RR.

CONCLUSIONS: There is an increased incidence and severity of OIIRR in patients undergoing comprehensive orthodontic treatment. In terms of clinical management, the results are inconclusive. However, there is evidence to support that lighter forces are more favorable than heavier forces in regard to incisor intrusion.

BOTTOM LINE: Attention to root resorption of teeth during and upon completion of orthodontic treatment is necessary. In terms of clinical management, there is no clear system to avoid RR completely. Monitoring the patient during treatment and after treatment (with follow-up radiographs) will help to reduce the incidence and severity of OIIRR.

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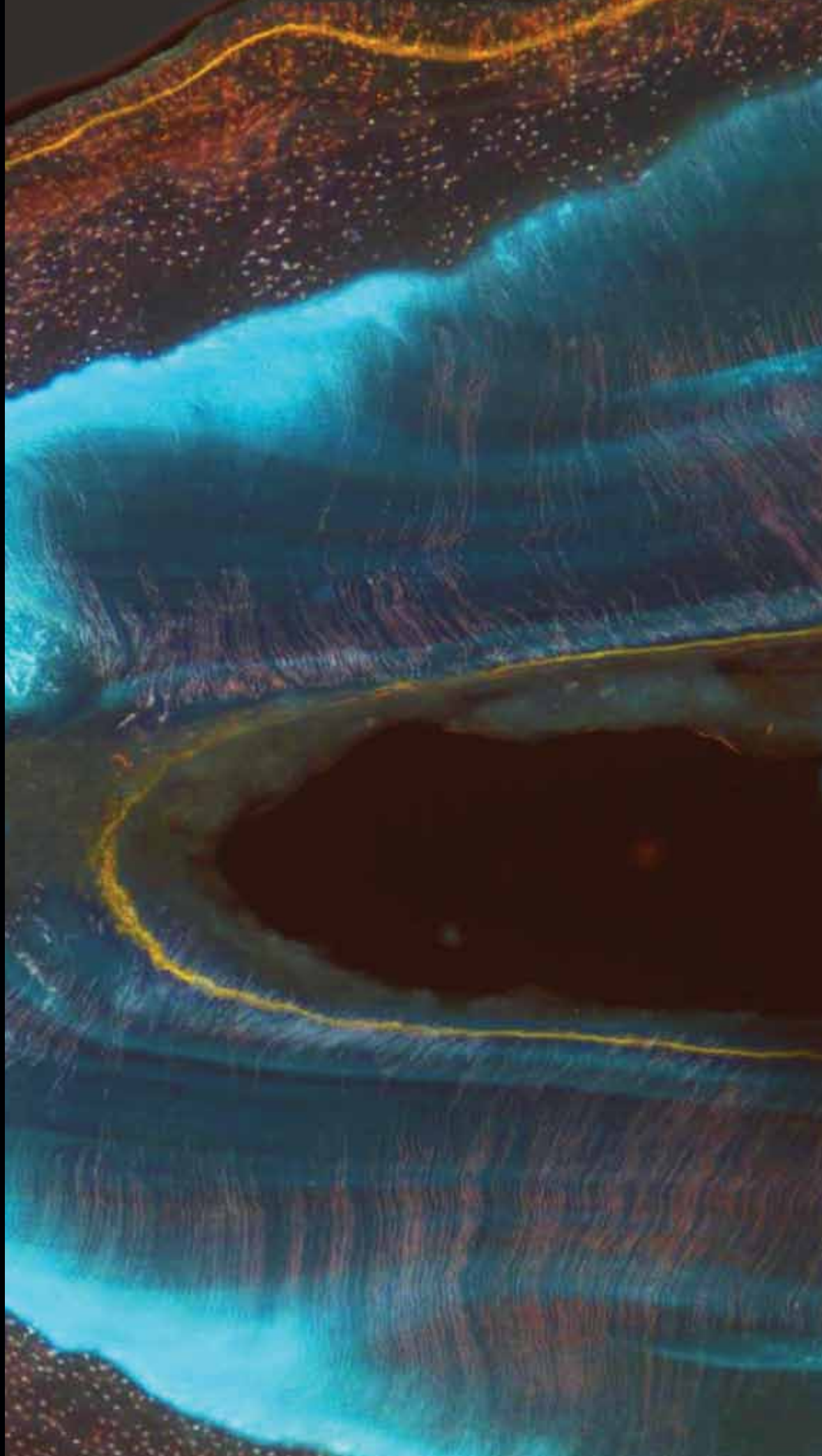

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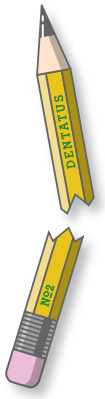

Fracture Strength in Restored Teeth Before and After Load Cycling: an In Vitro Study

NAFISEH ASADZADEH AGHDAEE, DDS, MS; J. GHANBARZADEH DARBAN, DDS, MS; AND A. MOHAJERI, DDS

ABSTRACT This study compares the fracture resistance of endodontically treated teeth before and after load cycling. Forty-two maxillary incisors were selected. In groups 1 and 2, casting post and core was used. In groups 3 and 4, Dentatus posts and composite were used, and in groups 5 and 6, FRC posts were used. The load cycling had no statistically significant effect on fracture strength among groups.

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The restoration of endodontically treated teeth is very important. It is even said to be more important than root canal therapy.[1] Unsuitable tooth restoration will result in failure because of an undesirable coronal seal. Due to the restoration leakage, oral microbial flora will penetrate to the root canals and finally get to the periapical region and create a periapical lesion that causes treatment failure.[1]

Since the incisors have an important role in beauty, speaking, and occlusion, their restoration can be very critical. With the development of dentistry and dental materials, different methods such as prefabricated pins or fiber-reinforced post (FRC posts) with composite cores have taken the place of old methods of casting post and core.[2]

Using prefabricated metal and nonmetal posts can restore the desirable function and strength of teeth, and reduce the danger of tooth fracture following casting restoration.[3] In some studies, there are various ideas about the extent of produced forces during swallowing that is due to tooth position, transducer location in mouth, vertical morphology of the face, gender, and periodontal support.[4]

Heydeck and Lee used a force of 30 N to determine the fracture strength of some post and core system in central incisor teeth for fatigue testing.[5,6]

Postrigidity is the first key factor to cause resistance to bending under function. Occlusal forces are transferred to root via dowels. The more dowels, cements, and restorative materials that act similar to dentin, the less force will be focused in the forming components of the root. Laboratory studies indicated that root fracture with metal dowels (prefabricated or cast) is more.[7]

Regan and coworkers examined the effect of cyclic forces on some kinds of post and core systems (two types of prefabricated post with amalgam core, the same two kinds of prefabricated posts with composite core, and, the last group of casting post core). There was not statistically a distinct difference among the various post core groups in this research.[8]

In Lee's study on central maxillary incisors, after removing the coronal section of the teeth and root treatment of them, he placed them in three groups. Fiber carbon post (C-post) in the first group, fiberglass post (para fiber white) in the second group, and titanium post (X Para-post) in the third group. Ti-core was used for the crown part in all groups. Specimens were placed under a 30 N force at an amount of 100,000 cycles. There was not a significant difference among the three groups from the standard point of fracture strength. The first and the second group showed the less willingness to root fracture. Except for one case in group 3, all fractures occurred at the upper part and outside the acrylic block.[6]

Thougthammachat et al. did research on static resistance before and after, performing fatigue loading in reconstructed teeth with four types of post and core systems. They were gold casting post base metal post core, Parapost, and FRC post. The results showed that the fracture resistance is less after fatigue testing. So the maximum resistance strength was recorded for fiber fill groups and there was not a significant difference between fracture strength in gold casting post and core and para-post.[3]

Xibe et al. examined the fracture strength of reconstructed canine teeth with three types of post and core systems after performing fatigue forces. The fracture strength of the specimens was measured at a universal system with a force of 10 KN at a cross-head speed of 0.5 mm/minute after performing 500,000 cycles with a force of 250 N at a frequency of 1.7 Hz. The results showed that fracture did not occur in specimens after performing fatigue forces. Secondly, there was not a significant difference due to fracture strength among groups.[9]

In another research by Hu et al., the static and fatigue resistance of some post and core systems were examined. The results showed that FRC group with composite core significantly had the maximum cycle that resulted in fracture, the gold post core, MPC, group had the most fracture. All MPC and FRC groups had unwanted root fractures.[10]

THERE WAS NOT a significant difference among the three groups from the standard point of fracture strength.

Nishimura et al. used cows' mandibular incisor teeth to investigate and compare some post and core system before and after cyclic loading. After cutting the coronal part and endodontic treatment, they reconstructed their crown part in the form of human maxillary central incisor teeth. The four post and core systems were composite post and core (R), prefabricated metal post with composite core (P), FRC post and composite core (F), casting post and core (M). The results showed that fracture strength did not have significant difference among M, F, and P groups without cycling loading. Also, the fracture strength of group R was significantly less than other groups; this amount was not significantly different before and after cyclic loading in other groups.[11] It is clear that fracture strength of these groups were the same as each other before and after load cycling.

The aim of this in vitro study was to compare the fracture strength of restored teeth with three different types of post and core systems before and after cyclic loading.

Materials and Methods

In this interventional study, 42 extracted human maxillary central incisors at an approximately similar size were selected with the aim of comparing fracture strength before and after cyclic loading. Teeth structure was investigated with a magnifier and transillumination to make sure they were free of cracks, fractures, or caries in cervical and root areas. Teeth were kept hydrated at room temperature in distilled water prior to the study. During tooth preparation, each tooth was wrapped with a water-moistened gauze.

The root canals of teeth were filled with an obturation system. After the endodontic treatments, each tooth was sectioned to the long axis 1.5 mm coronal to the buccal CEJ, using a super coarse diamond instrument (KS1, Brasseler, USA, Savannah, Ga.) so that the length of the remaining root was 15 mm. (Four and 5 mm is ideal.) Dowel spaces were prepared 11 mm deep using pizorimer II and then III (MANI,Inc., Kiyohara Industrial Park, Utsunomiya, Tochigi, Japan) to a diameter of 1.2. After preparing the canals, 42 specimens were randomly divided into six groups of seven.

In the first (M1) and second (Mc) groups (custom cast post and core), posts were made with autopolymerizing resin (Duralay, Reliance, Dental Mfg. Co., Worth, Ill.). The root segments and resin

TABLE 1

Mean Fracture Strength and Standard Deviation for Each Group

Studied Group	Number of Samples	Mean Fracture Strength	Standard Deviation
Group 1 (M1)	7	407.5	64.2
Group 2 (Mc)	7	382.8	58.4
Group 3 (P1)	7	318.2	48.2
Group 4 (Pc)	7	335.1	39.6
Group 5 (F1)	7	371.9	42.6
Group 6 (Fc)	7	364.6	34.5

TABLE 2

P-value in Two Investigated Factors

Investigated factors	Sig (P-value)
Load cycling	0.724
Reconstruction method	0.003
The effect of two factors on each other	0.536

patterns were then prepared to receive full chamfer complete crowns with a 1.5-mm ferrule feature included in the remaining coronal tooth structure; preparations were made with a 1.0 mm diameter diamond rotary cutting instrument (Brasseler USA), creating 1.5 mm of axial wall heights. The resin patterns were invested and cast with Super cast (Thermabond alloy msg, Los Angeles). Castings were inspected under original magnification x20 and adjusted to ensure a passive fit, then airborne-particle abraded using 25-µm aluminium oxide under 3 kg/cm^2 pressure. Glass ionomer cement (GC Corporation, Hasunuma-cho, Itabashi-Ku, Tokyo, Japan) was mixed according to manufacturer's instructions and used to lute the dowel and core castings. The cement was delivered to the canal space with lentulo spiral (Dentsply Maillefer, Tulsa, Okla.) and castings were held in place under finger pressure for five minutes.

In groups 3 and 4 (Dentatus post and composite core), root canals were prepared the same as groups 1 and 2, the Dentatus post (size XL2) was shortened to a 14.5 mm length. This adjustment resulted in dowels extending 3.5 mm above the coronal surface of the prepared teeth. Glass ionomer cement was mixed the same as the previous groups and was applied to the dowel and to the canal space with a lentulo spiral. The dowels were gently seated to place and held with light pressure until the cement reached initial setting (five minutes). Composite cores (Core Max II, Dentsply-Sankin k.k. Japan) in height were made on teeth extending 3.5 mm incisal to the sectioned tooth surfaces were fabricated for these two groups.

In a similar manner, in groups 5 and 6, each fiber glass post dowel (Angelus, Industrial Products Odontologics Ltda, Londrina, Brazil) was reduced to 14.5 mm length by cutting the apical end with a high-speed carbide fissure bur, again resulting in a dowel extending 3.5 mm above the coronal surface of the prepared tooth. A standardized amount of resin luting (Panavia F2, Kuraray Medical Inc., Okayama, Japan) was applied to dowel according to manufacturer's recommendations. At the end, 3.5 mm composite core was fabricated (Core Max II, Dentsply-Sankin k.k.) on the sectioned teeth.

The cores of teeth were then prepared for a complete cast crown using a high-speed medium-grit diamond rotary instrument (Brasseler USA) and water spray. The crown designs were the same as those used for groups 1 and 2. In the next step, wax copings were fabricated for each specimens. Each crown was then invested and cast with Super cast (Thermabond alloy msg). After divesting, crowns were inspected under original magnification x20 for fitting accuracy. After the correct fit was established, intaglio crown surfaces were airborne-particle abraded using 25-µm aluminium oxide under 3 kg/cm^2 pressure. The crown was cemented with glass ionomer cement (GC Corporation) mixed according to manufacturer's directions. Each crown was held for 10 minutes under finger pressure.

Periodontal ligament (PDL) with 0.3 mm was made with the Speedex (Speedex Light Body, Coltene Whaledent, Altstatten, Switzerland) around the roots. After that, the specimens were mounted in self-polymerizing acrylic resin (Formatray, Ker) at a 45-degree angle in the center of a cylinder measuring 2 cm height and 2.5 mm diameter 2 mm under the finish line of the teeth. Finally, in all specimens, the crown length was 10 mm (2 mm crown thickness, 3.5 mm core length, 1.5 mm finishing line, 3 mm biologic width) and the length of root was 10.5 in acryl.

After the final setting, in order to apply fatigue forces similar to the bite force, 21 specimens from groups 2, 4, and 6 were placed in a Zwick artificial mouth apparatus (Zwick Gmbh & Co. KG, Ulm, Germany) at Mashhad Dental School.

The load applied to each specimen was 3.6 kg at an angle of 135 degrees to the long axis of the tooth. Time duration to the applied force at each chewing cycle was 0.2 second and all cycles were 240,000, which was equal about one year of applied force inside the mouth. The applying force on teeth was designed in a way not to create any beat but to put pressure on teeth.

Then all specimens were placed under pressure at a cross-head speed of 1 mm/minute with Instron device (Zwick, Japan). The force was applied 2 mm more cervical than the incisal edge at a 45-degree angle to the long axis of

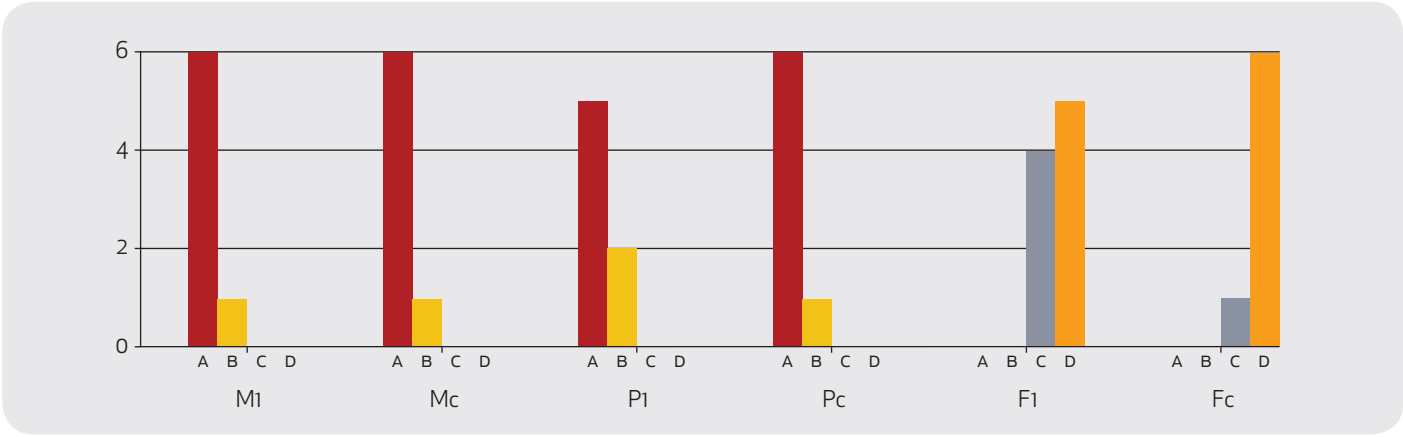

FIGURE 1. The numbers and location of fractures in all groups.

the tooth until the fracture occurred. During the test, data was recorded on the screen as a graph. The data was subjected to Tukey-Kramer and two-way ANOVA to determine significant differences at α=0.05. Classified failure modes were also analyzed by chi-square test at 5 percent significance level.

Results

At first, with the use of nonparametric Kolmogorv Smirnov, the authors investigated the assumption of being normal for six groups. The results indicated that at α=0.05 level, the assumption of being normal is accepted for all six groups. **TABLE 1** indicated the mean fracture strength and standard deviation for each group. As was seen, the maximum fracture strength was related to casting post core crown group 1 (M1) and the minimum was related to Dentatus post in group 3 (P1). With the Leven test, the assumption of equality to make the variance analysis possible was confirmed (P-value =0/4>0/05).

With the help of two-way ANOVA, the effect of tooth reconstruction method, cycling loading on each group, and their effect on a fracture strength variable, was investigated.

It became clear in **TABLE 2** that:

1. The load cycling factor did not have significant effect on fracture strength. (P-value=0/724)

2. The factor of the tooth reconstruction method had significant effect on fracture strength. (P-value=0/003)

3. There was no interaction between the two factors (method of reconstruction and load cycling). (P-value=0/536)

With regard to the significance of the tooth reconstruction method, the best method was investigated with the Tukey-Kramer test. The test at the level of α=0.05 indicated there is a significant difference between the M and P reconstruction method (0.0328) but no significant difference was seen between F and those two other methods (0.078).

In this study, the fracture position was investigated in groups. Four positions, based on created fracture places, in teeth are:[11]

Fracture A: The lowest fracture line is placed above the metal crown margin.

Fracture B: The lowest fracture line is placed between crown margin and tooth region inside the acrylic cast.

Fracture C: The lowest fracture line has reached the tooth root inside the acrylic cast.

Fracture D: There is more than one fracture line that has extended vertically as well as horizontally.

FIGURE 1 shows the results of the exact fissure test as the distribution of fracture types are related to groups. Fractures C and D were seen in groups Pc, P1,Mc. Fracture A and B are only seen in F1 and Fc groups.

Discussion

In similar researches that have investigated the fracture strength in different restored endodontically treated teeth, the results were related to the specimen selection, various post sizes, the types of posts used, materials and technique. In most studies, no attention was paid to the application of load cycling.[12-14]

In this research, the fracture strength of reconstructed teeth with cast posts and cores is compared with two methods of prefabricated post, para-post, and FRC post with composite core, before and after load cycling to determine which is more influenced in increasing teeth fracture strength. Due to the fact many of these studies on fracture resistance of different post and core systems have been done under static loads, their results can be questionable clinically. It is because bite forces cause fatigue forces and affect the fracture resistance of restored teeth.

In the McDonald et al. research, there is no significant difference in the fracture resistance between restored teeth with metal posts and carbon-fiber posts.[12] According to the study by Insuna et al., the minimum fracture load in the post and core casting group was higher than in the carbon-fiber post with composite core.[13] In Sendhilnathan's study, the fracture strength of reconstructed

teeth with casting post core was more than reconstructed teeth with titanium prefabricated post and composite core.[14]

However, in Xible and Reagan's research on fracture strength of some types of post and core systems after applying cyclic loading, there was no significant difference between FRC post fracture strength with composite core and a titanium post with composite core.[8,9]

In the study by Nishimura et al., the fracture strength of metal prefabricated posts with composite core, FRC posts with composite core, and casting post core before and after cyclic loading, was investigated. It showed there was no significant difference before and after cyclic loading.[11]

In the authors' research, although the load cycling factor did not have a significant effect on fracture strength, the tooth reconstruction method had a significant effect on fracture strength, and the fracture strength of a reconstructed group with para-post and composite core was significantly less than the cast post and core. Though maximum fracture strength is related to casting post core and after that to FRC post with composite core, and at the end to para-post with composite core, there was no significant difference between a cast post and core and a FRC post with composite core. Additionally, the difference between the two groups of RRC and para-post with composite core was not significant.

In research done by Reagan on some post and core systems, cyclic loading did not make any significant difference in groups under the study.[8]

In the Xible and Nishimura's studies, cyclic loading did not have a significant effect on fracture strength of studied groups.[9,11] The present study confirms the result that cyclic loading does not have a significant effect on fracture strength

Timothy G. Giroux DDS/Broker

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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**

of the aforementioned group before and after the application of loading.

In the studies on the type and position of created fractures in different kinds of post and core systems, similar results have been obtained. In research done by Krejei et al., it was seen that in a para-post group with composite core, most forces have been transferred to root and caused fracture. But in FRC post and composite core group, all of the fractures occur at crown.[15]

According to Insuna's study, teeth that were restored with carbon-fiber posts and composite cores, showed a fracture at the distance between core and post before the fracture occur in tooth, but all of the fractures occurred in teeth structure when they were restored with casting post and core.[13]

These results were confirmed in the authors' study. Post stiffness is the key parameter to cause resistance to bending under function. Occlusal forces are transferred to root through dowels. The more dowels, cements, and restorative materials act similar to dentin under function, the less force will be focused in forming components of root. It has been reported that the danger of root fracture with metal dowels is more.[7]

Carbon-fiber dowels or strengthened composite with glass fiber have similar modulus elasticity to dentin. This increases the ability of force to spread so the danger of root fracture will decrease.[1]

In Nishimura et al., the created fractures in the FRC post group with composite core occurred at the coronal region and these fractures were desirable, but in cast post and core group, and metal prefabricated post and core occurred in the root.[11] In this study, the results were the same, meaning the created fractures in the M and P groups were of an undesirable type and in root, and in group F, a desirable, restorable coronal fracture was created.

Conclusion

With regard to the limitation of this study, it was concluded that a casting post and core system has more fracture strength than para-post with composite core; but compared to FRC post with composite core, this difference is not significant. The created fractures in casting post and core and para-post were undesirable and in root, which made the restoration of the teeth impossible.

Clinical Significance:

Bite force is reported to be between 9-25 Kg in incisors, which is much less than the fracture strength of the tested specimens in this study.[11] Due to the fact that the chewing forces in anterior teeth are much less than the fracture resistance of specimens in this study, all of these three methods can be acceptable clinically, and the selection of each method depends on factors such as the amount of remained tooth, skill, and the preference of the dentist. ■■■■

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Effects of Nutritional Supplementation on Periodontal Parameters, Carotenoid Antioxidant Levels, and Serum C-Reactive Protein

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ABSTRACT Few studies have focused on the role of nutrition in periodontal disease. The purpose of this trial was to determine the effect of a nutritional supplement on gingival inflammation, bleeding, probing depth, clinical attachment level, carotenoid antioxidant level, and C-reactive protein. The test supplement, consisting of a standard multivitamin formula, as well as several phytonutrients associated with anti-inflammatory/antioxidant effects, provided modest benefits in reducing inflammation; however, further studies with larger populations and longer intervention are warranted.

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The role of nutrition in the etiology of inflammatory periodontal disease has received increasing attention since the 1980s. As our understanding of the pathogenesis of periodontal disease has developed, the link between nutritional intake and the immune response has taken on new relevance. Even though significant studies exist that show the impact of nutrition on systemic inflammation, there are very few referenced in the periodontal literature that address the effects of balanced nutrition and/or nutritional supplementation in the prevention and treatment of periodontal disease.[1]

An inverse relationship between systemic and salivary antioxidant status and

periodontal disease severity has been consistently reported in the literature, suggesting an increased requirement of antioxidants for patients affected by periodontal disease.[2-4] In fact, recent literature has suggested that supplementation may have a positive influence on periodontal disease status. Nishida et al. demonstrated a weak but statistically significant relationship between essential nutrients and periodontal disease.[5] Other in vivo research has shown that vitamin supplements may help reduce gingival inflammation and play an important role as an adjunct to routine patient home care. Munoz et al. reported that administration of supplements containing folic acid, cyanocobalamin (vitamin B_{12}), ascorbic acid (vitamin C), and various homeopathic extracts were associated with a reduction in gingival inflammation. Clinically, this resulted in a visible reduction in gingival erythema, a reduction in gingival bleeding, and a decrease in probing depths.[6] Additional human studies have examined the relationship between natural ingredients and their effects on periodontal disease. Hirasawa et al. showed that green tea catechins (the active ingredients in green tea) improved periodontal health through their bactericidal activity and led to a clinical reduction in probing depth.[7]

The nutritional supplement evaluated in the authors' study contained nutrients present in a standard multivitamin formula (vitamins A, C, E, B_6, B_{12}, folate, zinc, selenium, and copper) and several natural ingredients that have been linked to anti-inflammatory and antioxidant effects that may decrease inflammation associated with periodontal disease (gingivitis and periodontitis). These natural ingredients included green tea leaf *Camellia sinensis* extract, *Acacia catechu* heartwood extract, *Scutellaria baicalensis* root extract, alpha-lipoic acid, quercetin, and citrus bioflavonoids. Green tea leaf *Camellia sinensis* extract has been used in Asia for thousands of years and has been associated with antioxidant and anticancer properties.[8] *Camellia sinensis* has also demonstrated bacteriostatic effects against periodontal pathogens including *Porphyromonas gingivalis,* and *Prevotella* species, as well as cariogenic bacteria such as *Streptococcus mutans*.[7,9,10] Alpha-lipoic acid is a potent amphiphilic antioxidant that has the capacity to protect both water and lipophilic cellular compartments as well as the ability to recycle other key antioxidants such as glutathione and vitamins C and E.[11] Quercetin, derived from fruits and vegetables (and especially abundant in onions), is a flavonoid that has both antioxidative and anticarcinogenic properties.[12] Citrus bioflavonoids are potent antioxidants with the greatest chemical concentration in the citrus peel.[13] By providing a variety of antioxidant vitamins and phytonutrients at dietary levels, this formula is designed to support the entire antioxidant network and therefore confer protection against oxidative damage associated with periodontal disease.

IN VIVO RESEARCH has shown that vitamin supplements may help reduce gingival inflammation and play an important role as an adjunct to routine patient home care.

Periodontal inflammation is a complex biological process that involves several distinct mechanisms of action. It is possible that these mechanisms of action may be influenced by nutritional supplements that have milder biological effects than medications such as antibiotics, antimicrobials, and anti-inflammatories. Previous studies have demonstrated that single nutrients known to modulate inflammation may be inversely related to inflammatory markers associated with periodontal disease in humans.[14] However, very few studies have investigated the efficacy of a supplement containing phytonutrients with known anti-inflammatory characteristics to manage periodontal disease. The formula investigated in the current study includes *Acacia catechu* heartwood extract and *Scutellaria baicalensis* extract, two plant-derived extracts with documented anti-inflammatory effects.[9,10] A complex formulation was tested in this study rather than individual components in order to address the multiple mechanisms of action involved in periodontal inflammation and to provide baseline nutrition (vitamins and minerals) to a population that is often borderline deficient.

The purpose of the present study was to investigate the effects of a nutritional supplement containing essential vitamins and minerals, antioxidants, and anti-inflammatory phytochemicals in conjunction with routine oral hygiene practices (twice daily brushing, daily flossing) on inflammation and periodontal health in patients with confirmed periodontal disease. Clinical parameters including gingival inflammation, bleeding, probing depth, clinical attachment level, carotenoid antioxidant level, and serum C-reactive protein level were evaluated in response to the eight-week intervention.

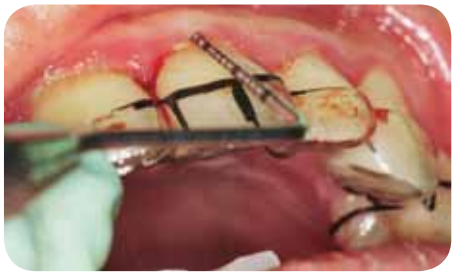

FIGURE 1. Custom plastic stent as a fixed reference for measuring clinical attachment level.

Materials and Methods

Subjects

The clinical protocol was approved by the Institutional Review Board at the California Pacific Medical Center (CPMC) in San Francisco. Subjects in good health (18-70 years old) were recruited from the Arthur A. Dugoni School of Dentistry in San Francisco; CPMC; and the general population. Subjects were required to have periodontal disease (mild to severe periodontitis), at least 20 natural teeth, no professional cleanings in the past eight weeks, an average gingival index score over 1.5, the Ramfjord teeth (Nos. 3, 9, 12, 19, 25, and 28) or adjacent counterpart with at least three Ramfjord teeth demonstrating probing depths of 4–7 mm and bleeding on probing. Exclusion criteria included pregnancy/nursing, systemic disease (diabetes, blood abnormalities, HIV/AIDS), pacemaker, premedication requirement, heavy calculus, rampant caries, extensive restorations, current orthodontics, need for extensive dental work, tobacco use, home bleaching, allergy to latex, intraoral/perioral piercing, and medications such as calcium channel blockers, anticonvulsants, or other which could interfere with the periodontal inflammatory process (e.g., >400 mg ibuprofen, >81 mg aspirin), bisphosphonates, antibiotics, immunomodulators (Periostat, CollaGenex Pharmaceuticals, Newtown, Penn.), antimicrobials).

Study Design

Participation required three visits to the research center: a screening, baseline, and final evaluation.

Screening

Upon study entry, the subjects were given an IRB-approved consent form to voluntarily sign. Subjects who met all study inclusion/exclusion criteria were randomly assigned to either the test or the placebo group using a table of random numbers. The test and placebo groups were not age and gender matched. Alginate impressions were taken for custom, vacuum-formed, plastic stents that served as fixed references for measuring probing depth (PD) and clinical attachment level (CAL).

Baseline Evaluation (Week 0)

Examiners reviewed subject medical/dental histories and then performed an oral soft-tissue examination, modified gingival index (MGI) and the Eastman interdental bleeding index (EIBI). PD and CAL were measured using the custom plastic stent as a fixed reference (**FIGURE 1**). Carotenoid antioxidant levels were measured and a blood draw was collected for determination of serum high sensitivity C-reactive protein (hs-CRP) levels. Upon completion of the exam, subjects were provided with their eight-week supply of either the test or placebo (control) product.

Final Evaluation (Week 8)

Examiners updated the medical/dental histories and repeated the oral soft-tissue examination, MGI, EIBI, PD, and CAL. Carotenoid antioxidant levels were measured and a blood draw was collected for determination of serum hs-CRP levels.

Test and Placebo Products

The test supplement (PF3 periodontal formula, Pharmanex LLC, Provo, Utah) contained vitamins present in a standard multivitamin formula and natural ingredients associated with anti-inflammatory effects. The placebo tablet consisted of only the inactive ingredients. Subjects were instructed to take two tablets of the test supplement or placebo after breakfast and dinner. Subjects were provided a toothbrush (Curvex, Ergonomic Dental Technologies, Inc., San Francisco) and dentifrice (Crest Cavity Protection Regular Paste, Procter & Gamble, Cincinnati) and instructed to follow their usual oral hygiene practices. The subjects also were directed to disclose any changes in medical history as well as the use of any vitamins or supplements during the study.

Oral Soft-Tissue Examination

Examiners performed an oral soft-tissue examination consisting of the lips, vestibule, buccal mucosa, tongue, floor of the mouth, gingiva, and the hard/soft palate.

Modified Gingival Index and Eastman Interdental Bleeding Index

Gingivitis was scored according to the modified gingival index (MGI), a noninvasive means of evaluating visual changes.[17,18] The gingiva surrounding each tooth (except third molars) was divided into marginal and papillary units. Each facial and lingual marginal and papillary gingival unit was scored on a numerical scale according to the following criteria: 0=absence of inflammation; 1=mild inflammation — slight change in color, little change in texture of any portion of but not involving the entire marginal or papillary gingival unit; 2=mild inflammation — as in "1" but involving entire marginal or papillary gingival unit; 3=moderate inflammation — glazing, erythema, edema, and/or hypertrophy of marginal or papillary gingival unit; and 4=severe inflammation — marked erythema, edema, and/or hypertrophy of marginal or papillary gingival unit; spontaneous bleeding or ulceration. The MGI for each subject was calculated by adding all of the individual marginal

and papillary scores and dividing this sum by the total number of areas scored.

Bleeding, a diagnostic criterion that is indicative of inflammation, was measured using EIBI.[19-22] A wooden triangular interdental cleaner was gently inserted horizontally (parallel to the occlusal plane) into all facial interproximal areas to depress the papillary interproximal areas 1–2 mm and then immediately removed. This process was repeated three additional times per interproximal area. The presence or absence of bleeding within 15 seconds was recorded for each area. The EIBI for each subject was calculated by summing the number of bleeding areas and then dividing by the total number of interdental areas examined.

The first examiner used the MGI and EIBI to evaluate gingival inflammation. This examiner had been previously trained/calibrated and performed these indices on all of the subjects in the study. This examiner had no knowledge of the assigned products (test or placebo) used by the subjects.

The first examiner used the MGI to noninvasively evaluate gingival inflammation followed by EIBI to evaluate bleeding, a diagnostic criterion indicative of inflammation[17-22] This examiner had been previously trained/calibrated and performed these indices on all of the subjects in the study. This examiner had no knowledge of the assigned products (test or placebo) used by the subjects.

Probing Depth and Clinical Attachment Level

The second examiner measured PD and CAL of each subject with a North Carolina probe and a custom plastic stent as a fixed reference (**FIGURE 1**). This examiner's repeat reliability using the North Carolina probe has been previously documented. This examiner had no knowledge of the assigned products (test or placebo) used by the subjects.

TABLE 1

Subject Anthropometric Data: Gender and Age

	Active + Placebo	Active	Placebo
# subjects	85	40	45
# (%) males	50 (58.8)	24 (60)	26 (57.8)
# (%) females	35 (41.2)	16 (40)	19 (42.2)
Age			
Average	38.6	37.9	39.3
Median	38	36.5	39
Range	20–68	20–61	21–68
Average (male)	36.9	34	39
Average (female)	41.1	42.7	39.7
Median (male)	34.5	30.5	37.5
Median (female)	41	43.5	40
Range (male)	21–68	22–60	21–68
Range (female)	20–61	20–61	23–55

Measurement of Skin Carotenoid Level

Skin carotenoids were assessed noninvasively using the BioPhotonic Scanner (Pharmanex LLC), a device that provides safe, rapid, valid, and reliable quantification of skin carotenoid levels, a reflection of total body antioxidant status. The Raman spectroscopy method has been described extensively in the literature.[23] Briefly, skin carotenoid concentrations were determined in the stratum corneum layer (outermost layer of the epidermis) of the skin by exposing a small area of the palm of the hand to a low-intensity blue (λ=473 nm) solid-state laser with green light (510 nm) detection for three to four minutes. Upon exposure to the blue light, carotenoids present in the exposed area shift the wavelength to green light (λ=510 nm), which is detected and converted into a relative signal and reported as Raman intensity "counts." The higher the counts, the higher the concentration of carotenoid molecules detected at the site of measurement. According to Bergeson et al., these Raman instruments have shown high repeatability with an average relative standard deviation of 9 percent.[24] One examiner was trained in the operation of this instrument and performed a once-per-day calibration following a standardized protocol using white field normalization and a two-point calibration curve.[24] The examiner performed two skin carotenoid readings on each subject: the first at baseline and the second at the eight-week (final) evaluation.

C-Reactive Protein Level

A blood draw for an hs-CRP assay was performed by a commercial lab at the baseline and final (eight-week) visits. This test was intended to evaluate any change in the hs-CRP (mg/L) relative to administration of test and placebo products.

Data Analysis

The unit of analysis was the individual subject, with clinical readings averaged within subjects. Two such scores (baseline/final) were calculated for each subject: the MGI, EIBI, the average PD, and the average CAL of all sites and the average within subjects for those sites with a PD ≥4 mm at baseline. There was a single baseline and final value for the hs CRP (mg/L) and carotenoid antioxidant levels (Raman intensity counts) for each subject.

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TABLE 2

Baseline and Final Clinical and Systemic Measures Associated With the Effects of a Nutritional Supplement Across All Oral Sites and at Sites With Probing Depths of ≥4 mm at Baseline (Means and [Standard Deviations])

		All Sites			*Sites 4 mm or Greater*		
Parameter	**Product**	**Baseline**	**Follow-up**	**Sig***	**Baseline**	**Follow-up**	**Sig***
Carotenoid antioxidant level (Raman intensity "counts")	Test	24.00 ± 8.83	28.03 ± 9.96	<0.01	same as all sites		
	Placebo	23.91 ± 7.97	22.87 ± 7.47				
C-reactive protein level (mg/L)	Test	2.12 ± 2.55	3.14 ± 4.30	NS	same as all sites		
	Placebo	2.20 ± 3.25	3.37 ± 3.37				
Modified gingival index (gingival units)	Test	1.29 ± 0.36	1.07 ± 0.40	NS	1.50 ± 0.42	1.18 ± 0.42	<0.03
	Placebo	1.19 ± 0.41	1.04 ± 0.38		1.31 ± 0.47	1.20 ± 0.40	
Eastman bleeding index (bleeding units)	Test	0.31 ± 0.57	0.15 ± 0.65	NS	0.43 ± 0.66	0.17 ± 0.39	<0.07
	Placebo	0.25 ± 0.40	0.15 ± 0.39		0.28 ± 0.44	0.19 ± 0.41	
Probing depth (mm)	Test	2.85 ± 0.39	2.60 ± 0.25	NS	4.22 ± 0.26	3.45 ± 0.38	NS
	Placebo	2.82 ± 0.24	2.60 ± 0.26		4.25 ± 0.26	3.45 ± 0.43	
Clinical attachment level (mm)	Test	6.67 ± 0.71	6.59 ± 0.65	NS	6.71 ± 0.71	6.58 ± 0.96	NS
	Placebo	6.47 ± 0.84	4.46 ± 0.69		6.42 ± 0.85	6.34 ± 0.78	

*Sig is p-value of paired-comparison t-test on gain scores (identical to repeated measures ANOVA in this case) for differences in change between test and placebo.

Descriptive statistics were used to provide further analysis that included repeated measures analysis of variance, multifactorial analysis of variance on gain scores for average clinical findings across all sites, and across those for sites with PD ≥4 mm, and stepwise multiple regression.

Two-factor ANOVA tests (test/placebo and initial PD <4 mm/≥4 mm); analyses of covariance with hs-CRP level and carotenoid antioxidant level as covariables; and stepwise multiple regression tests were also performed.

Results

Eighty-nine subjects met all exclusion/inclusion criteria and volunteered to participate in the study; four subjects were dropped during the study including a subject with an unrelated medical issue (at the four-week time point) and the others for noncompliance issues (failure to show at the eight-week time point). These subjects were not included in the final statistical analysis. Hence, 85 subjects completed the study with 40 assigned to the test supplement and 45 assigned to the placebo. Four subjects taking the test supplement reported mild gastrointestinal upset but completed the study. No other adverse effects were reported. Subject anthropometric data is provided in TABLE 1.

Both the test and placebo groups showed nonsignificant trends for improvement in gingival index score (decrease), bleeding index score (decrease), PD (decrease), and CAL (gain) (TABLE 2). There was no significant change in hs-CRP in the placebo or the treatment group over the course of the study (TABLE 2). The placebo group showed a small decrease in carotenoid antioxidant levels (Raman intensity counts) while the test group showed a significant increase (TABLE 2, FIGURE 2).

The data were analyzed for significant differences using a t-test on difference scores and a repeated measures analysis of variance (the results were identical on all such tests, as expected). When all sites were examined, there were no significant differences between the two groups in any of the parameters evaluated except the test supplement group showed a statistically significant increase in carotenoid antioxidant levels ($p<0.01$).

When only sites with a PD ≥4 mm at baseline were analyzed for changes in bleeding index score, gingival index score, PD, and CAL, both test supplement and placebo groups showed a decrease in all four periodontal parameters (TABLE 2). More specifically, the test group showed a statistically significant decrease in gingival index score ($p<0.03$) (FIGURE 3) when compared to the placebo. Although not statistically significant, the test supplement group demonstrated a decrease in bleeding index score ($p<0.07$ with significance at $p<0.05$) when compared to the placebo (FIGURE 4). There were no statistically significant differences between the test supplement and placebo groups for PD or CAL. With regard to

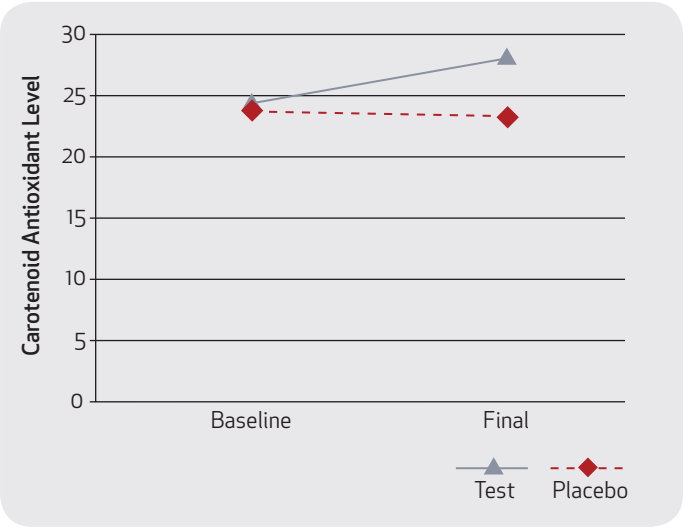

FIGURE 2. Difference in carotenoid antioxidant level between test and placebo groups from baseline to final evaluation.

oral hygiene, there was no reason to expect that this would significantly impact these parameters due to random assignment of the subjects to either the test or placebo group prior to commencement of the study.

The 2x2 ANOVA generally confirmed the results of the t-tests on difference scores for sites with initial PD ≥4 mm. Gingival inflammation was reduced significantly in the test supplement group (p=0.028) (**FIGURE 3**), but no differences for bleeding, PD, or CAL were observed.

The results of the analysis of covariance were more complex and, perhaps, more suggestive of the mechanism of operation involved in treatment. With gingival inflammation as the criterion measure, carotenoid antioxidant levels were highly significant as a covariate (p=0.005), and the test supplement group dropped out of significance as a predictor. High carotenoid antioxidant levels were associated with greater reduction in gingival inflammation. When bleeding was used as the criterion, carotenoid antioxidant levels again were a significant covariate (p=0.007), but the direction of effect was reversed, with high carotenoid antioxidant levels being associated with a reduction in bleeding. However, holding this and other factors statistically constant (the purpose of the analysis of covariance), the test group emerged as an important factor in reducing bleeding (p=0.005).

Discussion

The primary intent of this study was to determine the effect of a nutritional supplement on periodontal parameters (gingival index, bleeding index, probing depth, and clinical attachment level), hs-CRP level and antioxidant status. With regard to the periodontal parameters, the results of this study suggest that the nutritional supplement modestly decreased periodontal inflammation in a short period of time: eight weeks. For probing depths of ≥4 mm, the nutritional supplement was associated with a significant decrease in the gingival index score (p<0.03 with significance at p<0.05), and although not statistically significant, the test supplement group demonstrated a decrease in bleeding score. The nutritional supplement showed no significant effect on probing depth or clinical attachment level above and beyond the benefits of basic oral care practiced in both the placebo and treatment groups. The fact that the test group did not differ significantly from the placebo group on these parameters may be explained through a Hawthorne effect by the subjects as the findings overall suggested some improvement in periodontal health in all subjects.[25,26] It is possible that the placebo group improved their plaque control efforts as they were aware of their involvement in a study evaluating their oral health.

Raman spectroscopy (BioPhotonic Scanner, Pharmanex, Provo, Utah) was used in this study to assess carotenoid status in the subjects. In the past, carotenoid status has been used as a marker of overall antioxidant status in the body.[27] The device provides a noninvasive, rapid, and safe determination of skin carotenoid levels and has been demonstrated to measure the same carotenoids in the skin as those that accumulate in the blood (lycopene, ß-carotene, α-carotene, ß-cryptoxanthin, lutein, zeaxanthin, phytoene and phytofluene).[23,28] Gellerman et al. in 2002 found Raman spectroscopy to be an objective and quantitative measure of molecular carotenoid pigments in the human retina.[29] Hata et al. correlated the carotenoid values determined by Raman spectroscopy to levels of carotenoids obtained from tissue specimens of human skin removed from human subjects during abdominoplasty.[28] High performance liquid chromatography (HPLC) was used to determine carotenoid content of the removed tissue. Their results indicated that the Raman scattering method reflects the presence of carotenoids in human skin and is highly reproducible. Gellermann et al. later used skin carotenoid Raman instruments to measure the carotenoid response from the stratum corneum layer of the palm of the hand of 1,375 human subjects. They concluded that carotenoids are a good indicator of antioxidant status and thought that the Raman technique was precise, specific, sensitive, and well-suited for clinical studies.[30] Most recently, Zidichouski et al. in 2009 reported that the BioPhotonic scanner, which is based on Raman spectroscopy, is a valid and reliable tool to measure carotenoids in situ in human skin with less intraindividual variability than the measurement of serum carotenoids by HPLC analysis.[23]

The test supplement group demonstrated an expected increase in carotenoid antioxidant levels whereas no changes were observed in the placebo group. This

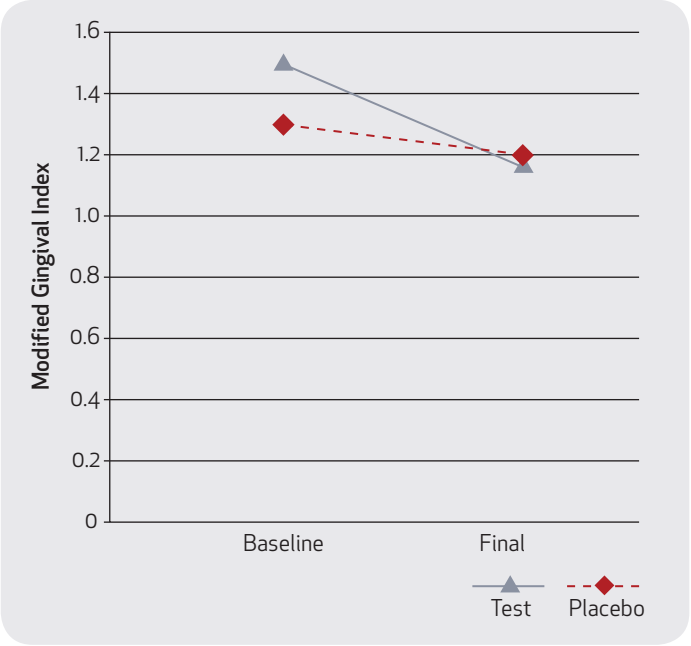

FIGURE 3. Difference in gingival index between test and placebo groups for sites ≥4 mm from baseline to final evaluation.

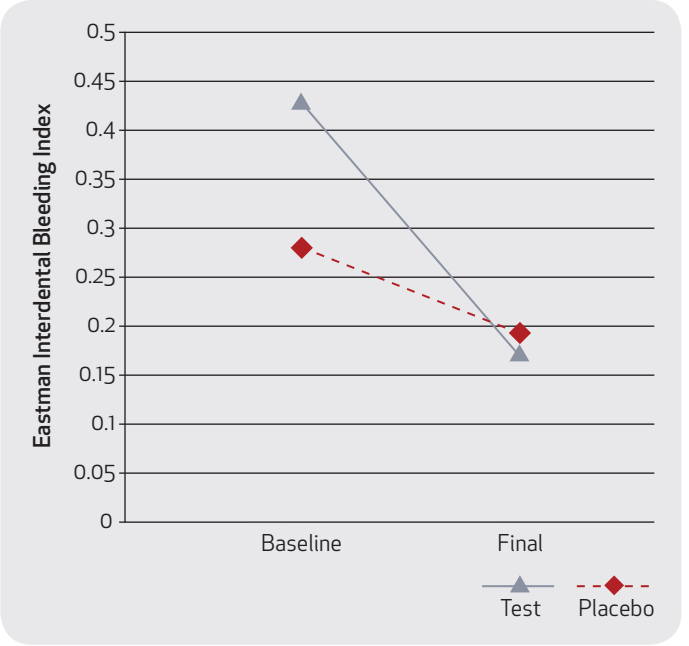

FIGURE 4. Difference in bleeding index between test and placebo groups for sites ≥4 mm from baseline to final evaluation.

was the only measured parameter where the test and placebo groups were significantly different ($p<0.01$) when considering all sites. The fact that the carotenoid antioxidant levels increased significantly from the baseline values in the test group provides support that the test subjects were compliant in taking their test supplement. Furthermore, the results of the analysis of covariance, using gingival inflammation as the criterion measure, revealed carotenoid antioxidant levels as highly significant covariate ($p=0.005$) and high carotenoid antioxidant levels were associated with greater reduction in gingival inflammation. This suggests that decreased gingival inflammation is a function of the elements in the treatment that are associated with carotenoid antioxidant levels. When bleeding and other factors were held statistically constant again using the analysis of covariance, the test supplement group emerged as an important factor in reducing bleeding ($p=0.005$).

CRP is a general marker for inflammation. It is an acute-phase protein that increases during systemic inflammation. Increased levels of CRP may indicate chronic or acute infection. The standard CRP test measures a wide range of CRP levels but is less sensitive in the lower ranges. The hs-CRP test more accurately detects lower concentrations of the protein, making it more useful than the standard CRP test in predicting an individual's risk for cardiovascular disease. The CRP tests are also very useful in identifying current infection, formulating a differential diagnosis, and monitoring disease activity. Periodontal disease is associated with a significant increase in serum levels of inflammatory mediators including CRP, and improved periodontal health is expected to result in a decrease of CRP.[31] It is interesting to note that the serum CRP levels tended to increase in both groups over the eight-week study trial suggesting a possible increase in systemic inflammation. Although the increase was not statistically significant, it is difficult to explain the upward trend. Several subjects did report some gastrointestinal upset in the test supplement group that may partially explain this finding in that group.

Another subject in the test supplement group reported having an upper respiratory infection at the final eight-week visit. It is possible that any decrease in periodontal inflammation was offset by increased inflammation at other sites such as the gastrointestinal or upper respiratory tract (even inflammation caused by arthritis can raise CRP[32]). Additionally, research has shown that CRP levels can be affected by daily activities involving exercise and diet.[33] This study did not include monitoring of the subjects' daily activities. Considerations for future studies may involve the keeping of a daily exercise log and a food diary. Obtaining further information about lifestyle may better explain any observed trends in CRP level. The range of hs-CRP level for developing cardiovascular disease is: <1.0 mg/L (low risk), 1.0 mg/L–3.0 mg/L (average/intermediate risk), and >3.0 mg/L (high risk).[33] This study involved primarily subjects within the average/intermediate risk range at baseline. Longer interventions may be required to see any statistically significant changes, up or down, in CRP levels.

Subjects in the present study were evaluated at a time between recall intervals when active disease, increased probing depths, clinical attachment loss, and bleeding on probing were all present. It is apparent that the short-term use of nutritional supplements, including those with anti-inflammatory and antioxidant potentials, appears to have some beneficial effects on markers that show disease presence or disease progression. Longer-term studies are warranted in order to determine if chronic supplementation may have a greater impact on disease prevention/treatment in this at-risk population. Disease prevention was not evaluated in this investigation. A possible value of nutritional supplements may be in the area of resistance to developing disease or recurrence of disease after treatment has established periodontal health. The possibility of improved tissue resistance to periodontal pathogens when these supplements are added to a preventive recall program is yet to be determined. Additional studies are suggested in this area.

The test supplement evaluated contained several ingredients with demonstrated and/or historical use as anti-inflammatory agents and/or antioxidants. In this study, it was not determined which individual agents had an effect on the periodontal parameters measured. As individual products were not evaluated, uncertainty exists if one or several are more active in disease prevention. Importantly, a combination of ingredients, such as the formula tested, is more reflective of a diverse, nutritionally sound diet than one composed of individual compounds. Further studies are recommended to evaluate the effect of individual agents compared to combination formulas on all the above parameters, indicators of periodontal health and progression of disease.

Reversing active periodontal disease with short-term nutritional supplementation in the absence of conventional active treatment, scaling and root planing, may not be possible and may depend on the severity of disease present. This does not preclude the value of supplements in maintaining overall patient health and reducing individual susceptibility to disease onset. The value of regularly scheduled recalls along with the monitoring and encouragement of adequate plaque control will also continue. Nutritional counseling and supplemental health products may be a valuable addition to this program as dentists strive to maintain oral health and assist their patients in retaining their natural dentition throughout life. This is a realistic goal for all dental health professionals — one that we should strive to achieve.

Conclusion

Under the conditions of this short-term study, the nutritional supplement significantly increased skin carotenoid antioxidant levels, and, for sites with probing depth ≥4 mm, the nutritional supplement significantly decreased gingival index score. There was no significant effect on bleeding, probing depth, clinical attachment level, or serum hs-CRP levels. Further research involving well-controlled, longer-term longitudinal trials of the effects of nutrients on periodontal disease is suggested. ■■■■

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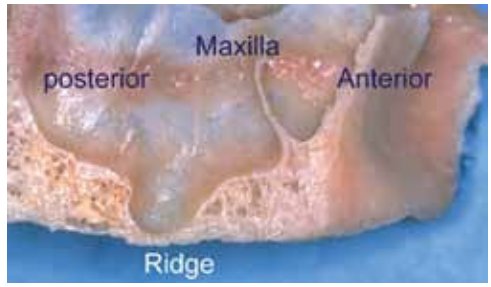

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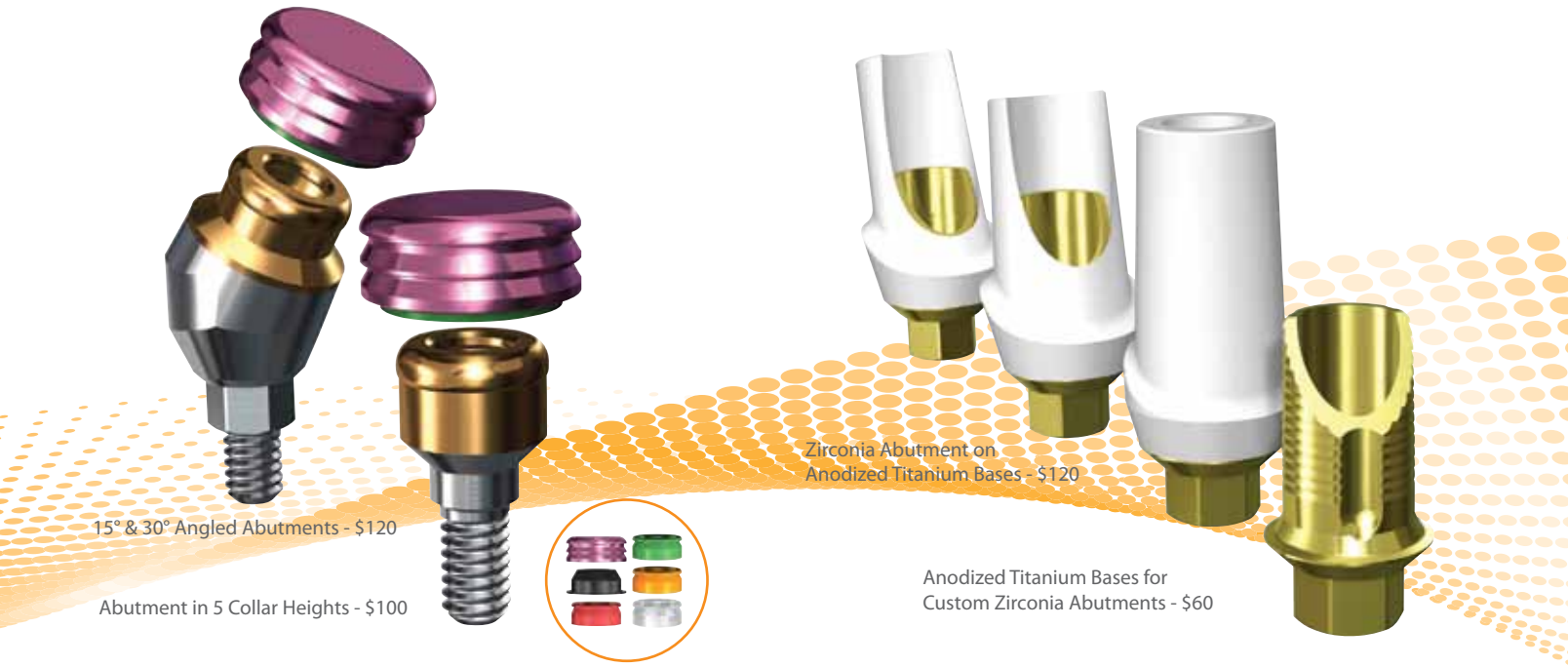

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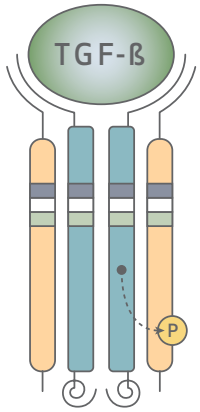

Molecular Regulatory Mechanism of Root Development

YEE HUNG, BS; XIAOFENG HUANG, DDS, PHD; AND YANG CHAI, DDS, PHD

ABSTRACT TGF-ß signaling is known to function during tooth formation. The authors' study investigated the role of TGF-ß signaling during tooth root development and determined how the common mediator for TGF-ß signaling, *Smad4*, affected root formation in mice. *Smad4* was specifically inactivated in all epidermal-derived tissues by using a two-component genetic system. The authors' findings show that when Smad4 expression is eliminated in the dental epithelium, there is lack of root formation and severe crown defects.

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Recently, much attention has been given to the prospect of tooth regeneration using stem cells. For example, dental pulp stem cells (DPSCs) and periodontal ligament stem cells (PDLSCs) transplanted into immunocompromised mice form dentin and cementum tissue, respectively.[1,2] Of particular importance is the regeneration of the tooth root. The root provides anchor and support for the crown and is essential during occlusal function. Current studies on stem cell-mediated root regeneration are focused on regenerating a root and its associated periodontal tissues. A clear understanding of the molecular mechanisms involved during root development will provide a foundation for determining how stem cells may differentiate into a tooth root structure.

The process of root development begins after the crown is completely shaped. The cervical loop is the structure responsible for root formation. It is a bilayer rim that is made of only inner and outer enamel epithelium. As it elongates and moves away from the newly completed crown area, it is called Hertwig's epithelial root sheath (HERS). The function of HERS is to shape the roots and induce root dentin formation. HERS induces the outer cells of the dental papilla to produce dentin and then HERS disintegrates. During disintegration of HERS, undifferentiated cells of the dental sac come into contact with the newly formed dentin and begin to secrete cementum. The authors' recent study has shown that HERS also contributes to the formation of cementum.[3]

At the molecular level, studies have shown that genes such as sonic hedge-

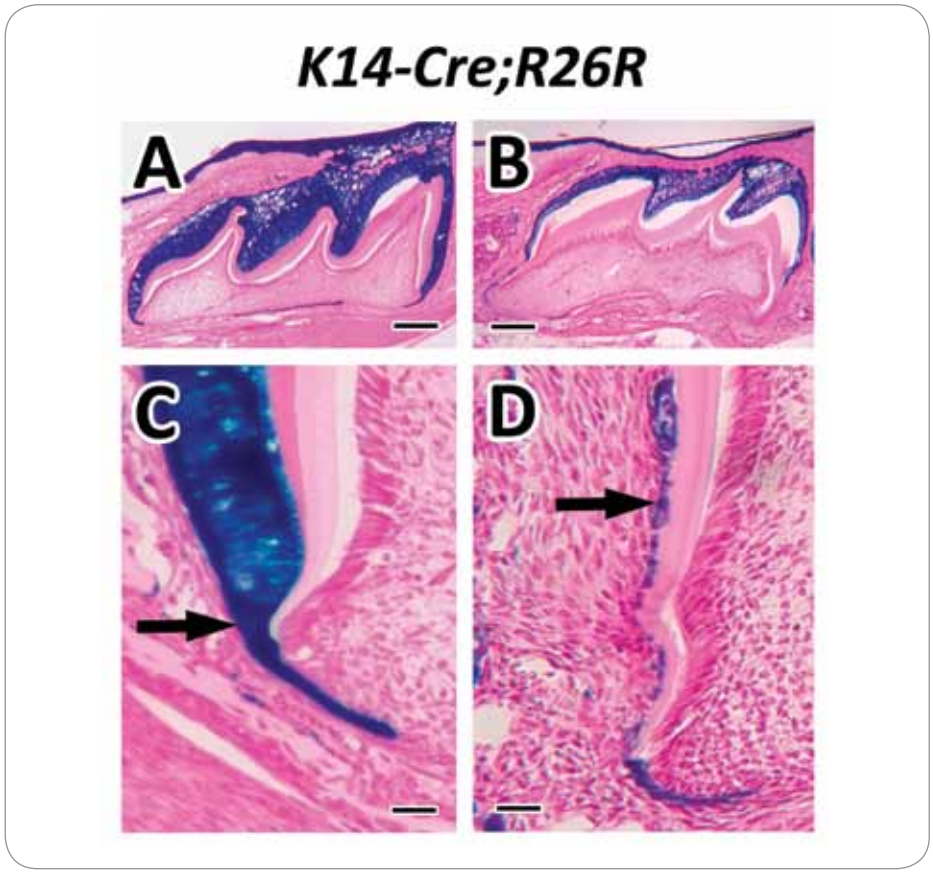
hog (*Shh*), bone morphogenetic proteins (*BMPs*) and *Nfic* regulate tooth root development.[4,5] When *Nfic* is knocked out in mice there is no molar root formation, suggesting that *Nfic* plays a key role in root development.[5] The authors' study focused on how TGF-ß signaling can affect the tooth root development.

The basic TGF-ß signaling pathway begins with binding of a ligand to a complex of receptors. The activated receptor then phosphorylates a protein called receptor-regulated Smad (R-Smad). R-Smad then can combine with the common protein to all TGF-ß family members, Smad4, to move into the nucleus and regulate gene expression. Previous studies in the authors' lab have shown that epithelial specific inactivation of *Smad4* in transgenic mice results in dental cusp patterning defects. Unfortunately, these mice die soon after birth, prohibiting the study of root development. To observe root formation postnatally in these mice, the authors' transplanted the mouse donor's teeth into a host mouse kidney capsule. Vascularization of the tooth graft occurs so that it is allowed to grow continually in the host environment.

The authors' findings show that inactivation of *Smad4* in the dental epithelium results in no root formation and severe crown morphology disruption. Compared to the *Nfic* knockout tooth, the *Smad4* conditional knockout tooth exhibits severe defects in crown and root formation. The authors' study provides novel insights about the regulatory mechanism of tooth development.

Materials and Methods

NOTE: All experiments involving the use of animals were approved by IACUC at the University of Southern California and performed according to guidelines.



FIGURES 1A-D. LacZ staining of *K14-Cre;R26R* mice at different stages of tooth development. (A) Postnatal Day 7.5 tooth germ. (B) Postnatal Day 13.5 tooth germ. (C) Postnatal Day 7.5 tooth germ showing positive staining in the epithelium during root development (arrow). (D) Postnatal Day 13.5 tooth germ showing positive staining in the epithelium during root development (arrow). Scale bars (A,B)=200 µm, scale bars (C,D)=40 µm.

Generation of Transgenic Mice

Male mice carrying the *K14-Cre* allele were crossed with female mice carrying the *R26R* conditional reporter allele to generate *K14-Cre;R26R* mice.[4,6] Male mice carrying the *K14-Cre* allele were also crossed with female mice carrying the $Smad4^{fl/fl}$ allele to generate $K14\text{-}Cre;Smad4^{fl/+}$ mice.[7] Then, male $K14\text{-}Cre;Smad4^{fl/+}$ were crossed with female $Smad4^{fl/fl}$ mice to generate $K14\text{-}Cre;Smad4^{fl/fl}$ alleles. Male heterozygous Nfic+/- and female heterozygous $Nfic^{+/-}$ mice were crossed to generate $Nfic^{-/-}$ mice.[5] Embryonic age was determined using noon of the day of vaginal plug observation as E0.5. PCR of genomic DNA extracted from tail biopsy was used to determine genotype.[8]

Detection of ß-Galactosidase Activity

Teeth were dissected at different postnatal stages and fixed by immersing in a 0.2 percent glutaraldehyde solution for 30 minutes at room temperature. Samples were soaked in 10 percent sucrose in PBS for 30 minutes at 4 degrees Celsius, and then incubated in a solution of PBS plus 2mM $MgCl_2$, 30 percent sucrose and 50 percent OCT at 4 degrees Celsius for two hours. Samples were frozen, sectioned at 10µm thickness, mounted on slides, and incubated in a detergent rinse solution (0.005 percent NP-40 and 0.01 percent sodium deoxycholate in PBS) for 10 minutes at 4 degrees Celsius. Sections were decalcified with 4.4 percent di-sodium EDTA and then stained

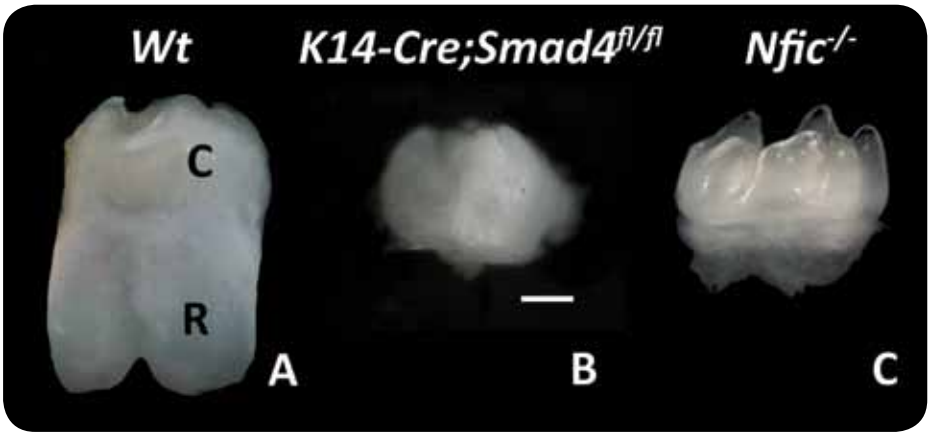


FIGURE 2A-C. Whole-mount buccal views of tooth organs. (A) Wild-type tooth germ obtained at E11.5 and cultivated for four weeks in kidney capsule. (B) *K14-Cre;Smad4*$^{fl/fl}$ tooth germ obtained at E11.5 and cultivated for four weeks in kidney capsule. (C) *Nfic*$^{-/-}$ molar tooth from postnatal Day 21. C: crown; R: root. Scale bar=200µm.

for ß-galactosidase activity overnight at room temperature in the dark.[8]

Kidney capsule transplantation embryos at E11.5 were dissected to obtain the mandibular tooth germs. The samples were cultured for one day while genotyping and then kidney capsule transplantation was performed. The host mouse was weighed and anesthetized. An incision was made through muscle in the back of the host mouse to expose the kidney. The tooth germ was placed under the kidney capsule and sutures were placed to close the muscular layer and skin.[9] The animal was monitored every day until the samples were harvested.

Results

K14-Cre;R26R *Mice Specifically Express Cre in the Dental Epithelium*

By crossing K14-Cre with R26R mice, the authors generated transgenic animals expressing ß-galactosidase in epithelial cells. Once *K14-Cre* expression commences in epithelial cells, the ß-galactosidase is indelible, allowing the ability to analyze epithelial cell lineage.

K14 was chosen as a promoter because it is expressed in the basal layer of the epithelium. Cells in this layer can be considered progenitor cells of the epithelium. Consequently, by following K14 positive progenitors, the authors were able to follow the progeny of dental epithelial cells throughout root development.

LacZ staining of histological sections at postnatal days 7.5 (**FIGURES 1A, 1C**) and 13.5 (**FIGURES 1B, 1D**) show that Cre-mediated ß-gal expression was present in every cell in the dental epithelium. A closer look at the root area, **FIGURES 1C-D** demonstrate positive staining specific to the epithelial cells in the root, Hertwig's Epithelial Root Sheath (arrows). This expression pattern persists throughout tooth development without ectopic staining in the dental mesenchyme. This data suggests that *K14-Cre* can be used to effectively mediate inactivation of any gene in the dental epithelium.

No Root Formation and Disrupted Crown Morphology in *K14-Cre; Smad4*$^{fl/fl}$ Mice

K14-Cre;Smad4$^{fl/fl}$ mice do not survive past birth; however, root development in mice continues on past birth. In order to study root development, the authors' dissected a portion of a mandible containing the lower first molars from the *K14-Cre;Smad4*$^{fl/fl}$ mouse at E11.5. This mandible was transplanted into a host mouse kidney capsule, cultivated for four weeks and then removed.

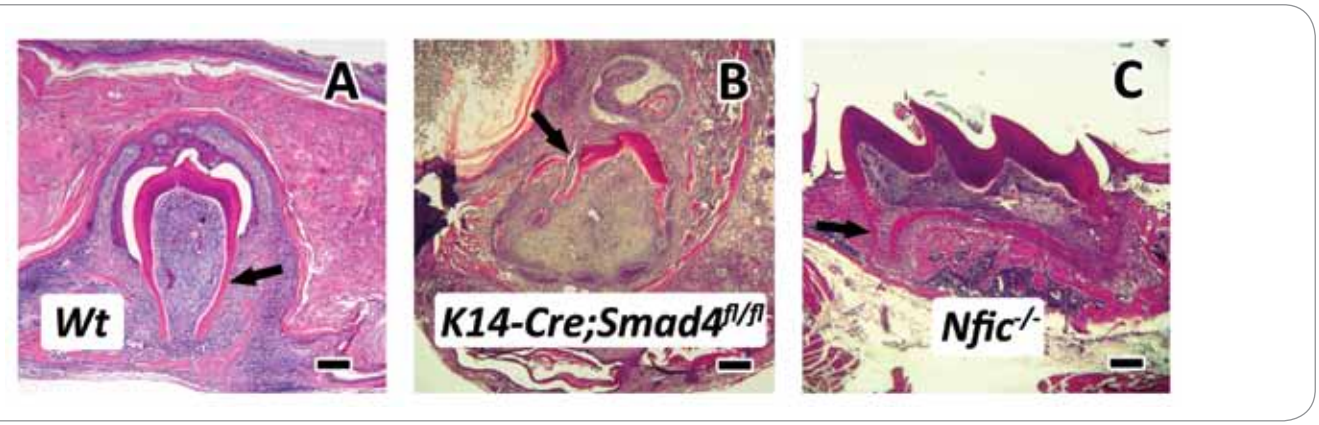
After four weeks of cultivation, the *K14-Cre;Smad4*$^{fl/fl}$ tooth developed into only a fragment of a tooth-like structure. There was no root formation in *K14-Cre;Smad4*$^{fl/fl}$ mice and morphology of the crown was severely affected (**FIGURE 2B**). The wild-type tooth germ, however, formed a normal crown with fully developed roots (**FIGURE 2A**).

H&E staining of histological sections confirm the lack of root development seen in the *K14-Cre;Smad4*$^{fl/fl}$ whole-mount tooth. In contrast, the wild-type tooth clearly shows extension of HERS apically (**FIGURE 3A ARROW.** In addition, the *K14-Cre;Smad4*$^{fl/fl}$ molar shows abnormal enamel and dentin formation (**FIGURE 3B ARROW**) compared to the wild type. The dental cusps in the *K14-Cre;Smad4*$^{fl/fl}$ molar are poorly patterned demonstrating that Smad4-mediated TGF-ß signaling affects crown and root development.

No Root Formation and Normal Crown Morphology in *Nfic*$^{-/-}$ Mice

In contrast to the *K14-Cre;Smad4*$^{fl/fl}$ mice, *Nfic* knockout mice can survive past birth. There was no need for kidney capsule transplantation to observe root development. The *Nfic*$^{-/-}$ molar tooth at postnatal Day 21 shows normal crown formation similar to the wild type but there is lack of root development (**FIGURES 2A, 2C**). Similarly, histology sections confirm that the *Nfic*$^{-/-}$ crown is well-formed (**FIGURE 3C**), but there is a lack of root formation (**FIGURE 3C ARROW**).

These findings indicate that *Nfic* is specifically required for root development. Molar crown formation begins during embryonic stages. However, molar root development begins at approximately postnatal Day 9 by outgrowth of HERS cells from the molar crown. These data suggest the relatively late role of *Nfic* in tooth development.



FIGURES 3A-C. H&E staining of sectioned tooth organs. (A) Wild-type tooth germ obtained at E11.5 and cultivated for four weeks in kidney capsule. The root of this tooth germ is shown to extend apically (arrow). (B) *K14-Cre;Smad4*$^{fl/fl}$ tooth germ obtained at E11.5 and cultivated for four weeks in kidney capsule. There are abnormal amounts of enamel and dentin deposits and poor cusp patterning (arrow). (C) *Nfic*$^{-/-}$ molar tooth from postnatal Day 21. The crown is able to develop normally; however, there is failure of root development (arrow). Scale bar=100µm.

Discussion

TGF-ß signaling is known for its ability to control cellular processes that govern animal embryo development. This pathway consists of a receptor complex that activates Smads and a Smad containing complex that controls transcription of downstream target genes. In vertebrates, ligands of the TGF-ß superfamily include TGF-ßs, activins, nodals, BMPs and GDFs. These ligands use different type I and type II receptors. The receptors for TGF-ß, activin and nodal recognize Smad2 and Smad3, whereas the BMP and GDF receptors recognize Smad1, Smad5, and Smad8. But on their way to the nucleus, these activated Smads all associate with Smad4, the common Smad.

In this study, the authors investigated the function of *Smad4* in regulating the fate of dental epithelial cells during tooth root development. To accomplish this, the authors crossed a *K14-Cre* mouse with a *Smad4*$^{fl/fl}$ mouse. The transgenic mouse that resulted would then have *Smad4* inactivated in all epidermal derived cells. The data demonstrated arrest of root development in *K14-Cre;Smad4*$^{fl/fl}$ mice. HERS cells did not continue to grow apically. This suggests that TGF-ß signaling in the dental epithelium is involved in root elongation. A comparison of the phenotypes of *K14-Cre;Smad4*$^{fl/fl}$ and *Nfic*$^{-/-}$ molar teeth points out the severe crown deformity seen in the *Smad4* conditional knockout mice that suggests *Smad4*-mediated TGF-ß signaling is required in the dental epithelium during crown patterning.

These results clearly demonstrate the necessity of *Smad4* in the epithelium for proper root formation. However, TGF-ß signaling is not the sole participant in root development. This is evidenced by the lack of molar roots in *Nfic* knockout mice as well. In addition, previous studies have shown that Fgf10 signaling is crucial for proper root formation. When *Fgf10* is overexpressed, root development fails.[10] In summary, there needs to be a fine-tuned orchestration of numerous growth factors in order for root development to proceed. The authors' findings help to gain a better understanding of the regulatory mechanisms governing tooth development.

In conclusion, this study shows another rootless animal model, *K14-Cre;Smad4*$^{fl/fl}$, demonstrating the key role TGF-ß signaling plays in root development. Clinical implications include an application of this knowledge toward tooth regeneration.[11] An understanding of the genes involved in root development will help future experiments aimed at turning stem cells into odontogenic phenotypes. Long-term goals would be using these findings to create a new type of therapy for our patients. Stem cells could be used to replace decayed tooth structure in place of materials such as porcelain or metal. ■■■■

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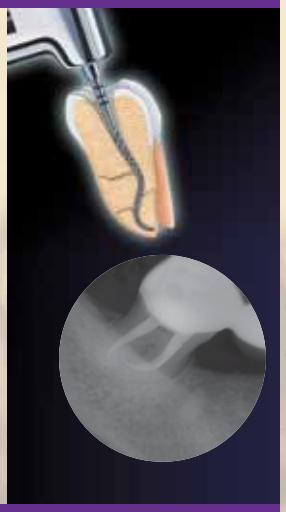

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CDA JOURNAL, VOL 39, Nº5

Velopharyngeal, Speech and Dental Characteristics as Diagnostic Aids in 22q11.2 Deletion Syndrome

SNEHLATA OBEROI, DDS; LINDA HUYNH, DDS; AND KARIN VARGERVIK, DDS

ABSTRACT This study examines velopharyngeal, speech, and dental parameters as possible diagnostic aids in 22q11.2 deletion syndrome. It is a retrospective study on 56 individuals. Twenty-one percent had a submucous cleft palate and 41 percent required palate surgery for speech. Common dental findings included poor oral hygiene, multiple carious lesions, congenitally missing teeth, class II malocclusion, and open bite. There are common findings that can aid the dental practitioner in recognizing the syndrome and make appropriate referrals.

AUTHORS

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22q11.2 deletion syndrome (OMIM 188400), an autosomal dominant condition with variable expressivity, is reportedly the most common syndromic cause of palatal anomalies (8 percent) and the most common microdeletion syndrome (1/4000).[1] This syndrome was first reported in 1978 by Shprintzen and colleagues, and may also be known as Shprintzen syndrome, and conotruncal anomaly face syndrome.[2] It is called DiGeorge syndrome when there is neonatal presentation of thymic hypoplasia and hypocalcaemia and velocardiofacial syndrome (VCFS) when there is nasal speech due to palatal insufficiency. CATCH phenotype replaced conotruncal anomaly face syndrome with the acronym representing cardiac abnormality, T-cell deficit, clefting, and hypocalcemia.[3]

The syndrome results from a genetic deletion of a small segment on the long arm of chromosome 22 (at 22q11.2), which can be confirmed using fluorescent in situ hybridization (FISH).[4] A multiplex ligation-dependent probe amplification assay has been shown to be successful in diagnosis of deletions of 22q11.2.[5]

There are more than 185 reported clinical features of the syndrome, most notably affecting the palate (velum), heart (cardia), and face (facies).[6] Palatal characteristics include a cleft (either submucous or overt) and velopharyngeal incompetence (VPI) resulting in speech defects. Cardiac abnormalities include ventricular septal defect (VSD), right-sided aortic arch, and Tetralogy of Fallot. Craniofacial characteristics vary, but often include a prominent nasal bridge with squared nasal root, narrow palpebral fissures, small cupped auricles with conductive hearing loss, downturned oral commissures, mandibular retrognathia, vertical

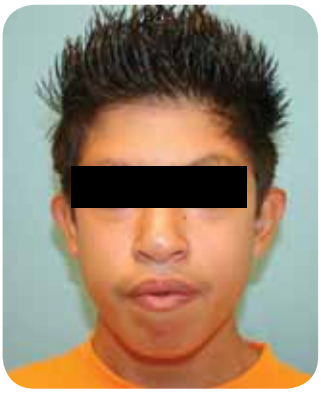

FIGURE 1. A 12-year-old boy with 22q11.2 deletion syndrome, exhibiting typical facial features.

maxillary excess with a long face (**FIGURE 1**), hypotonia, and platybasia (flattened cranial base).[7] Dental findings include congenitally missing teeth, delayed dental development (enamel hypoplasia, open bite, crowding, malocclusions, extensive dental decay with poor oral hygiene), decreased salivary flow, and an increase in streptococcus mutans bacterial load.[8-12]

Most 22q11.2 deletion syndrome individuals have some degree of learning disability such as cognitive or psychomotor delay, and psychotic disorders develop in approximately 10 percent of individuals with 22q11.2 deletion syndrome.[13] Schizophrenia is rarely associated with other syndromes but is 20 to 25 times more common in 22q11.2 deletion syndrome than the general population.[14]

Although the facial features of 22q11.2 deletion syndrome are well-described in the literature, they may be mild and not clearly diagnostic of the syndrome in the young child. There has been less focus on velopharyngeal, speech, and dental findings that also can be helpful as diagnostic criteria, particularly for the dental practitioner.[2,7,9,15-17]

The aim of this study was to examine velopharyngeal, speech, and dental parameters as possible diagnostic aids in 22q11.2 deletion syndrome.

To the best of the authors' knowledge this is the first cephalometric study on structures relevant to speech concerns in 22q11.2 deletion syndrome.

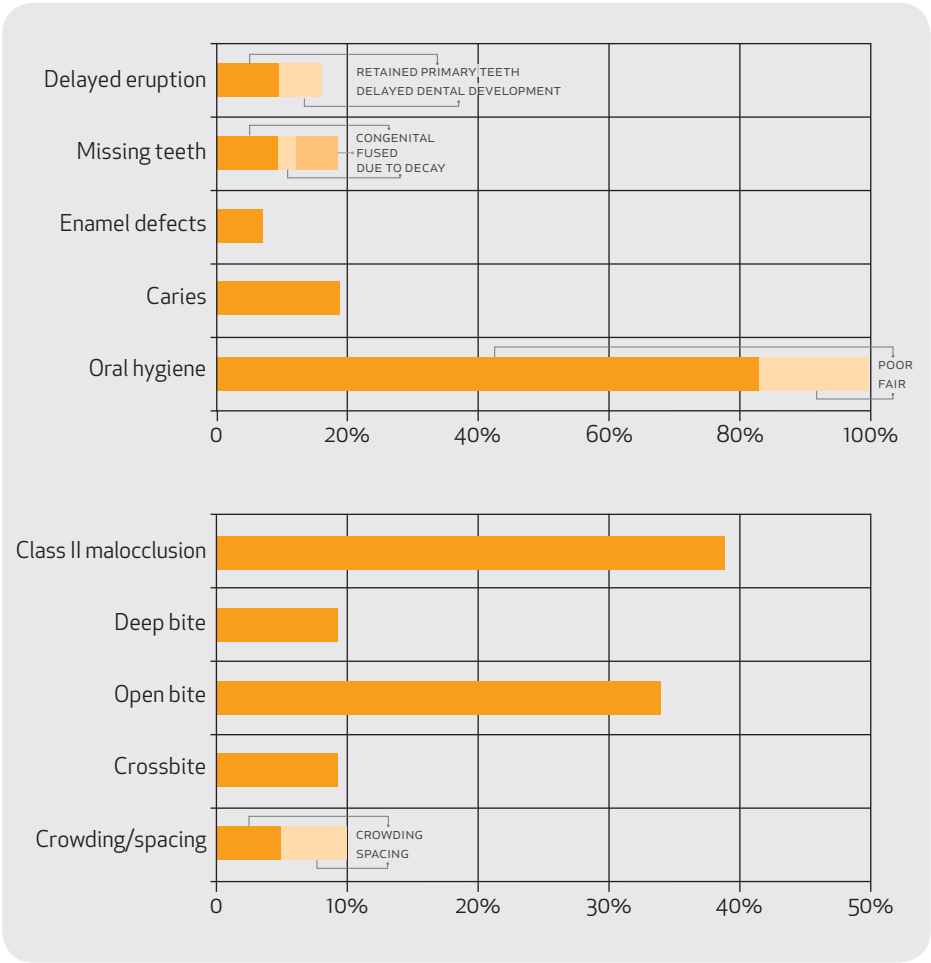

FIGURE 2. Dental findings in the authors' sample of 22q11.2 deletion syndrome.

Methods and Materials

This was a retrospective study carried out on chart reviews and panoramic and cephalometric radiographs to record gender, age, presence of a cleft, palate surgery, velopharyngeal and speech characteristics, and dental findings of individuals with 22q11.2 deletion syndrome from the University of California, San Francisco, Center for Craniofacial Anomalies computer database (Filemaker Pro 5.5) using the key words: velocardiofacial syndrome (VCFS), DiGeorge, and CATCH 22. An expedited CHR (committee on human research) approval was obtained from the University of California, San Francisco. All 100 individuals recorded with the deletion syndrome were included as the beginning sample frame. Fifty-six of these individuals met the authors' inclusion criteria of a positive 22q deletion and had clinical and radiographic records available for review. At the clinical exam, ages ranged from 2 months to 11 years.[18] At radiographic examination, ages ranged from 3 to 14 years.

Chart Review Findings

Of the 56 individuals 52 percent were males, 48 percent females, 21 percent had a submucous cleft, and 41 percent had a palatal surgical procedure to improve palate function for speech. The speech findings were speech-language delay in 50 percent of the subjects, velopharyngeal insufficiency (VPI) in 41 percent, phono-

TABLE 1

Lateral Head Film Measurements: Cranial Base Angle, Nasopharyngeal Depth, Palatal Length and Depth, and "Need" Ratio

Measurement	Mean	Subtelny Norm
Cranial base angle (s-n-ba)	134.6°	128°
Nasopharyngeal depth	28.47 mm	19.9 mm
Palatal length	28.9 mm	28.3 mm
Palatal thickness	7.2 mm	8.2 mm
"Need ratio" (nasopharyngeal depth/palatal length)	1.05 = 92% of indiv. above norm	0.69 = 69%

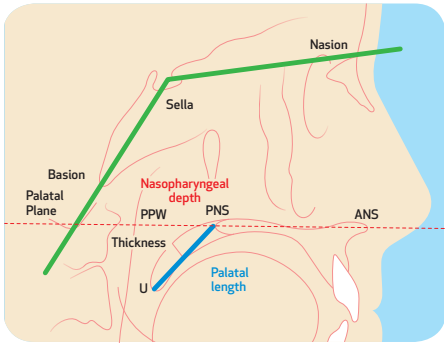

FIGURE 3. Tracing of a lateral head film, showing landmarks and measurements of cranial base angle, nasopharyngeal depth, palatal length, and thickness.

logic delay in 36 percent, and dyspraxia in 9 percent (TABLE 1). One-hundred percent of the subjects exhibited some type of speech or language deficiency.

Dental findings included poor oral hygiene in 82 percent (diagnosed by the presence of plaque and gingival inflammation at the time of the clinical exam), multiple carious lesions in 39 percent, congenitally missing teeth in 12.5 percent, delayed eruption in 16 percent, and enamel defects in 7 percent (FIGURE 2). A single maxillary central incisor was found in one individual with 22q11.2 deletion syndrome, previously reported.[17] Class II malocclusion was found in 39 percent, open bite in 34 percent, crowding in 5 percent, spacing in 5 percent, unilateral crossbite in 3.5 percent, bilateral crossbite in 3.5 percent, and deep bite in 9 percent (FIGURE 2).

Cephalometric Study

Lateral head films were assessed to determine cranial base and naso-velopharyngeal characteristics. As indicators of nasopharyngeal depth, the cranial base angle and the ratio between nasopharyngeal depth and palatal length and thickness were measured on lateral cephalometric head films (FIGURE 3). These measurements were used to determine the probability of velopharyngeal closure for speech, the "need" ratio. The cranial base angle was measured from nasion to sella to basion. Nasopharyngeal depth was measured as the linear distance from the posterior nasal spine (PNS) of the hard palate to the posterior pharyngeal wall (PPW). Palatal length was measured from the posterior nasal spine (PNS) of the hard palate to the tip of the uvula (U) of the resting soft palate.

All lateral head films had been taken on the same cephalostat, with magnification 9.8 percent. Five randomly selected cephalograms were traced by two separate investigators, with a time interval of one week. Reliability of duplicate measurements were assessed by Lin's concordance and Pearson's product correlation. Measurements from the lateral head films were compared to Subtelny norms in which the growth of the soft palate in 30 normal individuals was measured.[19]

Results

Analysis of tracing error for all measurements showed a Lin's concordance and Pearson's product correlation of above 0.9, indicating excellent reliability.

The average cranial base angle was 134.6 degrees, 6.6 degrees greater than the Subtelny norm of 128 degrees. The average nasopharyngeal depth was 28.47 mm, compared to the Subtelny norm of 19.9 mm. The average palatal length was 28.9 mm, while the Subtelny norm was 28.6 mm. The "need" ratio for the 22q11.2 deletion syndrome individuals was 1.05, while the Subtelny norm was 0.69. Ninety-two percent of the individuals had a "need" ratio above the Subtelny norm.[19]

Discussion

This study confirms previous findings on craniofacial morphology and provides new information on dental and cephalometric velopharyngeal findings related to speech in the 22 deletion syndrome. These common recognizable characteristics are presented in detail as they can alert the dental practitioner to the possible diagnosis of 22q11.2 deletion syndrome.

The number of individuals with a cleft (21 percent) in the authors' sample was lower than reported in the literature ranging from 33 percent to 98 percent.[20,6] Fifty percent of the individuals with a cleft and 39 percent of those without a cleft required palate surgery for speech. This was similar to that reported in the literature.[14]

All individuals had speech and/or language deficiency with the most common speech finding being speech/language delay, 50 percent and VPI, 41 percent, similar to findings in the literature.[11] Although no formal test results were available, all had some degree of developmental delay similar to that reported in the literature, 92 percent.[14]

The average cranial base angle was 134.6 degrees, 6.6 degrees greater than the Subtelny norm of 128 degrees. The finding of a significantly increased cranial base angle (platybasia) might be a contributing factor to velopharyngeal dysfunction in 22q11.2 deletion syndrome.[21,22] The flatter cranial base results in retroposition of the posterior pharyngeal wall, leading to a wider nasopharyngeal airway.[23] The greater velopha-

ryngeal depth found in the authors' study results in a greater "need" ratio as compared to the Subtelny norm. The disproportion between palate length and nasopharyngeal depth results in nasal air escape and hypernasality. VPI may also in part be due to muscular hypotonia. Although only 21 percent of the subjects had a submucous cleft, 41 percent required a palatal surgical procedure for speech purposes.

Poor oral hygiene found in 82 percent of the individuals may be associated with psychomotor delay.

Dental caries, found in 39 percent of the authors' patients, could be related to the poor oral hygiene and cognitive impairment. This is of importance, as individuals with 22q11.2 deletion syndrome frequently have congenital cardiac malformations and decreased immune response, thereby increasing the risk of bacterial endocarditis. Hypodontia was found in 18 percent; higher than in the general population where figures of 10 percent in the permanent dentition and less than 1 percent in the primary dentition have been reported.[24] The high prevalence (34 percent) of open bite may be a function of hypotonia and may require early intervention by dental specialists.[25] The high prevalence (39 percent) of class 2 malocclusion is due in part to micrognathia, a common feature of 22q11.2 deletion syndrome.

Conclusion

The authors identified common craniofacial, speech, and dental findings that can aid the dental care provider to recognize the syndrome and to make appropriate referrals. In addition to the facial and dental characteristics, the speech and language deficiencies and nasopharyngeal disproportion, including the open cranial base angle and increased "need" ratio, were constant findings in the authors' sample and should alert the clinician to

the possible diagnosis of 22q11.2 deletion syndrome. If the syndrome is suspected, genetic testing and referral to a craniofacial team is appropriate. The common dental findings of poor oral hygiene and high caries rate are important to note as children with this syndrome frequently have congenital cardiac malformations and compromised immune systems. ■■■■

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SACRAMENTO FOOTHILLS OFFICE FOR LEASE OR SALE — Beautiful, turn-key office in high-end retail center available for lease or purchase located in Sacramento Foothills. Owner finance okay. Contact 916-390-5993.

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.

CONTINUES ON 336

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 335

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

SPACE AVAILABLE FOR RENT — Fully equipped, high technology, five chair operating suite to share. Beverly Hills area. Completely digital, CEREC AC. Contact 310-652-6472.

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 — A great place for a family to live? A practice with a great income and a future? Family, friends and a community? This is the place. Join our team and be "working together to be better." Try Missouri, you'll like it. Contact Sheila at 573-201-9298.

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 340

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**

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**

B-956 BERKELEY- Professionally planned, efficiently laid out for ease of workload and patient flow overlooking Berkeley Hills. 792 sf w/3 ops **$220k**

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

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-877 LOS ALTOS -Pristine Professional plaza. Office is ~ 2,400sf - 6 ops **2009 Collections - $819k!! Reduced to $350k to offset rent amount**

D-9091 ATHERTON -Turnkey operation 969 sf & 3 ops ***Call for Details!***

D-925 SANTA CLARA - Retail Center in the heart of the Silicon Valley. 1,500 sf & 3 ops **$499k**

D-9331 SARATOGA– FACILITY– GD & Specialists! State of the Art Equip. 1,187sf w/3 ops **$98k**

D-960 *Facility only* SAN JOSE - Establish primary or satellite office with minimal start-up costs. This would cost more than our asking price to duplicate! *Reasonable rent and great lease* with **opportunity to purchase condo suite also!** 1,158sf w/3 fully equipped ops **$118k**

D-963 MONTEREY—No time for hesitation!! ~1,330sf w/ 4 ops **$575k**

D-965 Gilroy - Location and a large stable patient base! Office ~ 2,393sf, w/ 4 equipped ops + plumbed for 4 add'l ops. **$420k**

D-967 SAN JOSE – FACILITY—A fully equipped facility in the Silicon Valley! Like new, this beautiful scratch-start office is conveniently located. The suite ~1,000+ sf w/ 4 ops **$195k**

D-968 MILPITAS— FFS practice is situated on the corner of two major thoroughfares. Office is ~ 1,950sf w/2ops. **$175k**

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-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 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**

E-961 SACRAMENTO -Great opportunity! Doctor averages 12-15 patients w/ 6-8 Hygiene patients per day. . Office is located near two major thoroughfares and has 5ops**. $325K**

E-948 WOODLAND - Customized service in warm and caring atmosphere. 5 ½ hygiene days/w. Office ~ 1,400 sf w/ 4 ops. **$465K**

G-751 RED BLUFF/CHICO- Complete remodel ~5 yrs ago. FFS GP. 2350sf /4 ops. Plumbed for 2 add'l. **Practice $50k / Real Estate $185k**

G-875 YUBA CITY–Estab. 30 + years, GP, FFS, 3575sf /9 ops, great location. **$1.63m w/Cerec**

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

G-952 PARADISE- Well-established fee-for-service practice. Ample parking w/ remote controlled, privately locked garage. 1,138 sf w/3 ops **$185k**

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**

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**

CENTRAL VALLEY CONTINUED

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

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

I-951 MODESTO- Street-level suite. Dental Professional building. 886sf w/ 3 ops **$265k**

I-966 MODESTO - Facility The practice newly renovated, w/ professional décor and floor plan. Sparkling, immaculate Office ~ 700sf w/2 ops, **$89k**

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 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**

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**

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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.

SOLD

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 2,500 sq. ft. stand alone professional building. Avg. GR for past 4 years $1.4M+ with 61% overhead and just 4 doctor-days/week. Asking $1,134,000.

SOLD

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- **BARSTOW:** *For Sale*-General Dentistry Practice. Gross Receipts $395K with an adjusted net income of $193K. Office consists of 1,100 sq. ft. 4 operatories. Intra-Oral camera, Dentisoft. There are 3-hygiene days per week. Practice has been in its present location for the past 25 1/2 years.
- **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. #14345
- **EL DORADO HILLS:** *For Sale*-General Dentistry Practice. 2009 GR $790,758 adjusted net income of $310K. Intra-Oral camera, Pano, Softdent software, 4-equipped ops. 6-hygiene days. Practice has been in its present location for past 18 years. Owner retiring. #14324 SOLD
- **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. 1,600 active patients. Leased office is 2,000 sq. ft. with 4 equipped operatories - 5 possible. Patient Base software. Owner to retire. #14350 SOLD
- **FOLSOM:** *For Sale*-General Dentistry Practice. Gross Receipts in excess of 1.5M the past three years. 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
- **FRESNO:** *For Sale*-General Dentistry IV Sedation Practice. (MERGER OPPORTUNITY) Owner would like to merge his practice into another high quality general dentistry or IV sedation practice. The merger would be into Buyers office. Seller would like to continue to work as either a partner or associate after the merger. 2010 collections were $993K with a $422K adjusted net income. There are 7 days of hygiene.
- **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. Intra-oral camera, Diagnodent, EZ Dental Software. Good Location. Owner retiring. #14337
- **GREATER FAIR OAKS-SUNRISE AREA:** *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
- **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. #14349
- **IRVINE & COSTA MESA:** *For Sale*-General Dentistry practice combined. Gross receipts combined $781K with adjusted net of $396K. Both office spaces are leased with 4-5 ops in each. Both are 1,600 sq. ft. Irvine is equipped with Intra-Oral Camera, Pano & Dentrix. Costa Mesa is equipped with Laser, Intra-Oral Camera, Pano and Dentrix
- **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. #14352
- **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 1,082 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 SOLD
- **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. #14348
- **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 rx rms, laser, Intra-Oral camera Pano and Ceph. Call for details. #14319 SOLD
- **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 SOLD
- **NAPA:** *For Sale*-General Dentistry Practice. Gross Receipts $800K, with adjusted net income of $269K. Fee for Service. 1300 sq ft 4 ops 6 hygiene days. 38 yrs in present location, 30 yrs in previous location. Owner to retire. SOLD
- **NEWPORT BEACH:** *For Sale*-General Dentistry Practice. Practice has operated at its present location since 1986. Located in a highly affluent Newport Beach community. Three (3) hygiene days per week. Leased office space with 4 ops. in 1,450 sq. ft. Pano & Practice Works software.
- **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. 2010 Gross Receipts $610K. 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. 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. 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. SOLD
- **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 SOLD
- **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 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. #14315 SOLD
- **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 SOLD
- **SAN LUIS OBISPO:** For Sale -Two Doctor General Dentistry Practice. Gross receipts $1,537,142 for 2010 with an adjusted net income of $691K. The office has 2,331 sq. ft. with 8 equipped operatories. Pano, E4D, and Dentrix software. Practice started in 1990 and has been in its present location since 1998. Approx. 3000 active patients. Great location with nice views.
- **SANTA CRUZ:** For Sale-General Dentistry practice. Gross Receipts $300K with a 57% overhead. Office is 1,140 sq. ft. 3 equipped operatories. Intra-Oral Camera, Pano, Digital X-Rays, and Dentrix software. Practice has been in its present location since 1980. Owner retiring.
- **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. Gross Receipts $434K with 38% overhead. Owner relocating. #14320
- **TURLOCK:** For Sale- General Dentistry Practice. 2009 Gross Receipts $2,728,319 with an adjusted net income of $925,251. 13 days of hygiene in this tastefully decorated 3,000 sq ft office space. Owner is retiring form clinical dentistry. SOLD
- **VISALIA:** For Sale- General Dentistry Practice. Gross Receipts $616K with an adjusted net income of $ 3[illegible]K. 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 SOLD

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CLASSIFIEDS, CONTINUED FROM 336

SEEKING MANAGING DENTISTS — If you're looking for a long-term commitment and desire to be productive the opportunity is yours! Seeking full-time, managing dentists to join large group practice in the following areas: Los Angeles, Orange County, Inland Empire, San Diego and doctors willing to relocate to Arizona. Steady patient flow in high volume HMO environment. Required: 3-5 yrs experience and proficient in molar endo. Benefits include: medical, dental, vision, 401K, malpractice coverage and competitive pay! For available positions please call: 714-428-1305, submit your resume to kristin.armenta@smilebrands.com or fax to 714-460-8564.

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PRACTICES FOR SALE

COASTAL EUREKA PRACTICE FOR SALE OR LEASE — Family practice in beautiful semi-rural area with fantastic outdoor recreation. Production/collection average 80,000/month with high net, a FFS practice with no capitation and doctor only working 14 days/month. Large loyal patient base would support two dentists. Great growth potential by adding endo, perio, and oral surgery and increasing work schedule. Priced at $625K. Building available for favorable lease or purchase. Owner considering adding associate dentist while transitioning to retirement. Call after 6pm pacific time 707-499-9799.

GP FOR SALE NEAR BERKELEY — Doctor has to leave state due to spouse transfer. Twenty years in practice, three operatories plumbed for four. Growth potential, currently working 32 hours. Asking $190K. If interested call 925-207-7976 or email ddsdeb@mac.com.

CONTINUES ON 342

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5999 **PLEASANTON** Great visibility in busy strip shopping center. 3-Ops with 4th available. Computerized Ops, intraoral cameras, digital radiography. 2010 collected $692,000 with Profits of $400,000. First 3-months of 2011 collected $231,400.

6000 **MILLBRAE** Downtown sidewalk location, computer charting, digital radiography, strong patient base. 2010 collected $725,000. 4-Ops, 3-equipped.

6002 **SAN JOSE'S EVERGREEN VALLEY – FILIPINO PRACTICE** Located near East Capitol Expressway & Highway 101. 4-day Hygiene Schedule. Averages $600,000 year in collections. Housed in 3-year old suite. 4-Ops with computers.

6003 **PINOLE - HERCULES AREA** 4-days of Hygiene. 90%+ effective Recall. Produced $740,000 and collected $709,500. Low AR balance. Endo referred.

6004 **SAN JOSE'S SANTA TERESA AREA** Asking slightly more than what it would cost to replicate this office today. Digital & paperless 3-Op suite. 2010 produced $385,000 with collections of $277,000 and Profits of $190,000+. Gorgeous facility. Lease allows occupancy thru 9/30/2024.

6005 **FAIRFIELD - WEST OF I-80** Seeks full-time Successor. Operating on 2.5 week schedule by Owner with other commitments. Collected $500,000 in 2010 with great Profits. 2-days of Hygiene, 18+ new patients per month. Attractive 3-Op suite. High visibility location.

6008 **MENDOCINO COAST** Busy practice located in desirable cultural haven on ocean. Busy hygiene department with Owner working relaxed schedule. $700,000+ performer.

6010 **BERKELEY – ALTA BATES MEDICAL VILLAGE** This location benefits from the economic muscle flexed by its mighty neighbor, UC Berkeley. Attractive revenues with strong Profits. Last 2-years Profits have averaged $225,000. 2011 is doing better.

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No. L.A. CTY – (5) op compt. G.P. in a shop ctr. w excell. exposure/visibility/signage. Annual Gross Collect $800K-900K. Cash/Ins/PPO/HMO/small % Denti-Cal. Cap Ck $5K+/mos. **SOLD**
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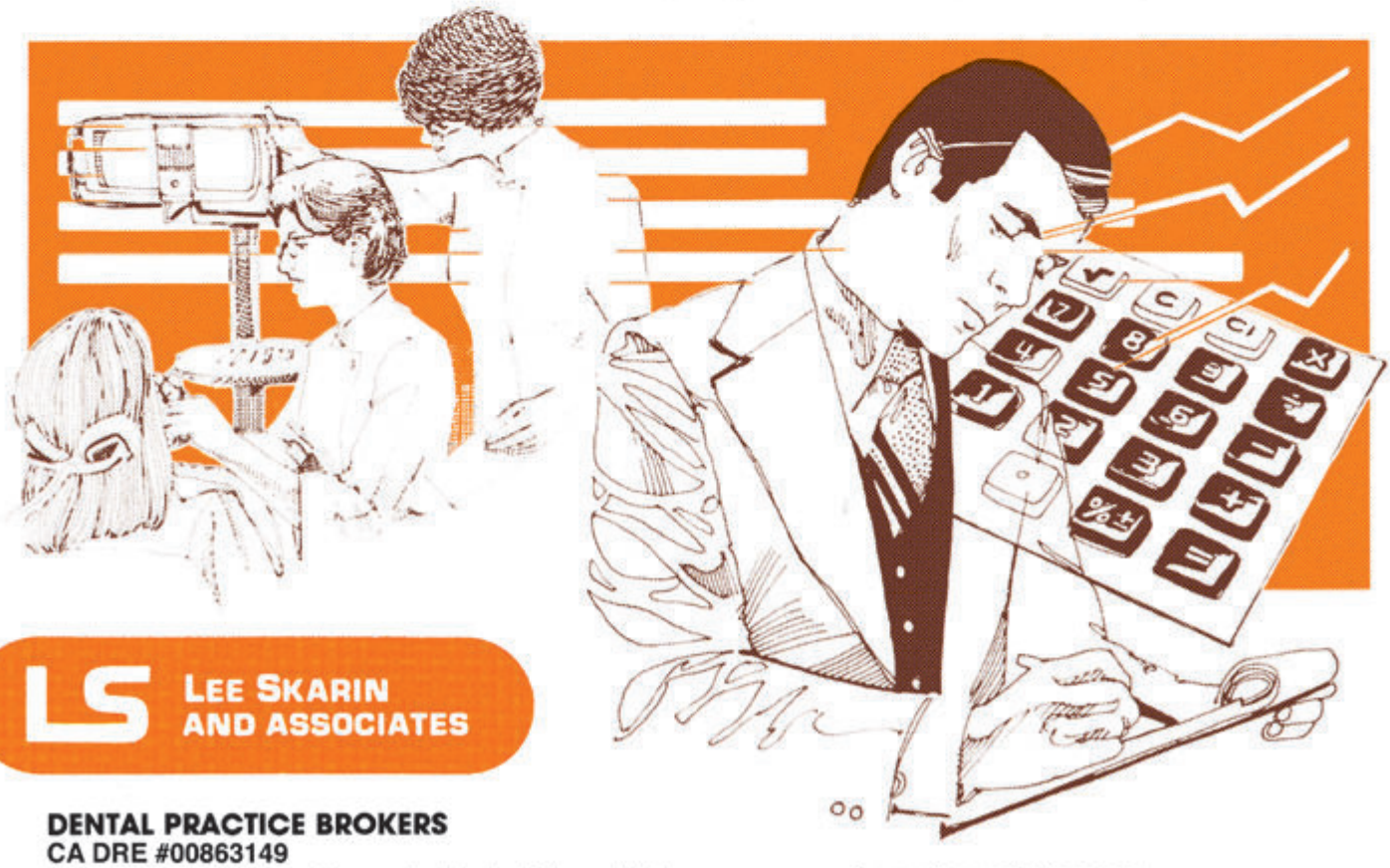

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DR. BOB, CONTINUED FROM 346

from the challenges of housework, child maintenance, and the downward spiraling twin disasters of hair and integument.

This would account for the popularity of *The View, Tyra Banks, Oprah* and a host of other talk shows where women endlessly discuss issues that would render a man comatose before the first commercial. The foundation for daytime television historically rests on "soaps," so-called because Procter & Gamble, Colgate-Palmolive and Lever Bros. were early sponsors.

The soap opera came into existence back in the early days of radio, although Faraday, Marconi, Tesla and Edison always steadfastly denied having anything to do with the concept. Nevertheless, between 1931 and 1946, women paused in their daily routine, transfixed in front of their Philcos entranced with the insecurities of Myrt and Marge who didn't know they were mother and daughter for 10,000 episodes. After World War II, women enthusiastically made the transition to television when *All My Children, One Life to Live, As the World Turns,* and *The Young and the Restless* debuted.

Unlike the comics such as Peanuts, Dagwood and Dennis the Menace where the cartoonist may eventually die, but the characters live on at a fixed state of development for eternity, soaps emulate real life. Of special interest to women is an ageless actor named Susan Lucci, one of the earliest cast members of *All My Children*. Although rumored to be chronologically well over 100 years old, she still appears to be about 45. The cast of *General Hospital* should be engaged for a couple of episodes to diagnose how she manages this. No doubt Dr. House, with his smooth bedside manner and impeccable appearance could be persuaded to appear for a consult.

In any event, the trials and tribulations of daytime television act as a major soporific on the unfortunate male viewer with time on his hands. Other than the occasional shooting of a philandering lover, talking heads and soul-baring just don't cut it entertainment-wise.

The gourmet meal competition resulted in little dabs of exotic unidentifiable food units served up to cranky judges who obviously considered roast beef, mashed potatoes and gravy to be too plebian.

Possession of the Y chromosome requires programming wherein explosions occur regularly. Transport is always by motorcycle, racing cars or airplanes, which must eventually disintegrate. How to build something or destroy it is acceptable; risking sudden death mountain climbing, deep-sea diving or high-speed car pursuits is considered a noble goal. Compared with this menu, a few hours with Dr. Phil or one of the dozen court programs like *Judge Judy* wherein hapless litigants whine their way through unsatisfactory solutions, dead air is obviously the way to go.

It was thought that food shows might capture an audience of both genders, combining their mutual fascination with eating to sustain it. But then the cake makers went crazy with towering inedible edifices that nobody knew how to serve. The gourmet meal competition resulted in little dabs of exotic unidentifiable food units served up to cranky judges who obviously considered roast beef, mashed potatoes and gravy to be too plebian.

Having lost most of the male audience at the outset, fancy food shows also disengaged many women who guiltily conceded that, contrary to Julia Childs, the microwave oven was the greatest boon to housewives since the telephone made pizza and Chinese instantly available. Martha Stewart, Rachel Ray and Paula Dean will send enquiring ladies endless recipes, but the chance of these dishes ever appearing on a man's dinner table defies all laws of probability. He doesn't even care, he has a nifty motorized can opener with a bottle opener attachment. He ordered it online along with a high-tech electric knife that's not available in stores and takes eight to 10 weeks for delivery, but wait! If he called in ***right now,*** he got a second can opener for only four payments of $29.98! PLUS a DVD compilation of NASCAR's greatest crashes.

No question, daytime TV is as durable as daytime itself, a fact that any man contemplating retirement might want to consider as the gateway to learning new and thrilling adventures in home maintenance involving vacuum cleaners, washers, dryers, and a thousand solutions for attacking soap scum and carpet stains. Edgar Guest said that it takes a heap o'livin' to make a house a home. He should have recommended it be balanced with a heap o'afternoon nappin'. ■■■■

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The Days of My Life

In any event, the trials and tribulations of daytime television act as a major soporific on the unfortunate male viewer with time on his hands.

Robert E. Horseman, DDS

ILLUSTRATION BY DAN HUBIG

Rest is a good thing, but boredom is its brother. — Voltaire

There are many reasons why a man will chose to retire. Reaching his expiration date is one, but basically his main concern is how to spend a lot of time without spending a lot of money. The fact is, he will never do all the things he thought he would do when he had the time and frequently finds that now he can do anything he wishes, he wishes he could do something else.

With seven months into my retirement, my advice to all males contemplating the nebulous pleasures awaiting him after cleaning out his desk and eschewing the rat race is this: Stay home for two weeks and watch daytime television shows. Then reconsider.

It isn't that there is nothing to watch — upward of 200 channels are available. The concept of "dead air" freezes the marrow in TV executives, but the content of the programming is such that the average man, unless confined to a bed in ICU intubated in every orifice, would never consider viewing it unless potent sedatives were available.

Except for weekends when the seasonal sports of football, baseball and ice hockey prevail and the excitement level is so intense that women have been known to slump right over from ennui, daytime television is essentially a woman's purview. In sole control of the remote, here is a sanctuary offering a few hours of reprieve where she can excuse herself

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