Journal

CALIFORNIA DENTAL ASSOCIATION

March 2014

Understanding Root Resorption With Diagnostic Imaging

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CDA JOURNAL, VOL 42, N°3

Out of the ER

Ruchi K. Sahota, DDS, CDE

The number of emergency room visits for preventable dental conditions in California is growing at a faster rate than the state's population.

Twenty-eight days. New patients have to wait almost a month to get an appointment for an exam in many of California's community clinics. According to the California HealthCare Foundation, the group of Federally Qualified Health Center clinics in our state is an unorganized, loose association of clinics that is hardly a safety net. A surprisingly large number of patients are falling through the net and landing in our local hospitals.

In fact, diabetes is *not necessarily* the most common chronic disease seen in patients in California emergency rooms. Twenty-six out of 58 counties' emergency departments report higher rates of patients with preventable dental conditions than for both asthma and diabetes.[1] In fact, dental pain is the cause for more than 2 million visits to emergency rooms throughout the country every year. And the number of emergency room visits for preventable dental conditions in California is growing at a faster rate than the state's population.[2]

When are these patients with dental pain visiting hospital ERs? On the weekend? At night? When our offices are closed? No. A recent *Journal of Oral and Maxillofacial Surgery* (JOMS) article unexpectedly found otherwise, stating, "The majority of the patients presented between 7 a.m. and 6 p.m. on Monday through Thursday, with the highest percentage on Monday."[3] In fact, women ages 21 to 34 are the highest users of ERs for dental problems.[2]

The ADA reports that almost 20 percent of lower-income adults admitted that they or a household member, during some point in their lifetime, had turned to the emergency room because of dental pain. Unfortunately, the majority of these adults (94 percent) left without a final resolution for their pain.

Because very few hospitals have dental clinics or dentists on staff, patients with dental complaints are routinely sent home with analgesics and antibiotics. The pain may subside for a short time, but the cause of the problem remains. The cavity. The abscess. The tooth. The disease remains. And the statistics agree. Ninety-six percent of lower-income adults who visit the ER with dental pain self-report that their problem was *not* solved.[4] The *JOMS* article focused on a pilot program designed to reduce the burden on already overcrowded emergency rooms. Patients were redirected from the ER into an urgent dental care clinic inside the hospital staffed by dentists. The number of patients treated in the ER decreased by half. And only a third of those patients returned for a successive dental issue.

Maine also has a proven method to help reduce return visits. Eleven of Maine's emergency departments employ a simple protocol. Patients who present with dental pain receive two directives: a prescription for antibiotics and analgesics and a referral slip for a local clinic or oral surgeon. This resulted in a 70-percent reduction overall in ER visits for dental pain.

Revolutionizing resolutions exist in other parts of the country as well. Local dentists and community leaders in Calhoun County, Mich., came up with a novel solution. Low-income inhabitants were diverted out of the ER and into local dental offices. The dentists provided care. In exchange, the patients provided community service to local nonprofits. The ADA reports that ER visits for dental pain decreased by 72 percent over five years and repeat visits are very rare. Calhoun County reaped the benefits two ways: the hospital saved $6 million and the community received more than 43,000 hours of volunteer service.

Such out-of-the-box thinking is crucial. We need more providers in underserved areas. We need opportunities and people to provide care in school settings, nursing homes and rural areas. Additional inclusion of oral health information in medical, nursing and other health provider curricula may strengthen the connections between dentists and other members of the medical community.

In the last few years, we have seen organized dentistry unite with policymakers to ease the access to care issue in our state. Henry Ford said, "Coming together is a beginning; keeping together is progress; working together is success." Success may come in increments. Be it increased fluoridation. Be it increased reimbursements for Medi-Cal patients. Or be it simple protocols that divert patients out of our emergency departments. We will have to do what Michigan did. Dentists and community leaders will have to come together and think out of the box to help get dental patients out of our ERs. ■

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The Proximal Surface of Morality

David W. Chambers, PhD

I learned to distinguish proximal from distal years before becoming associated with dentistry. Psychologists and philosophers use the terms to point to those things close at hand and under our direct control and to things we intend and strive for in the general and longer view. It is as if the proximal is the means and the distal the ends of our activities.

Consider the question: what caused the patient to get better? One answer might be "RTC with Thermafil following an evidence-based dentistry (EBD)-justified protocol." An equally good reply would be, "A particular practitioner very carefully treated the patient with wisdom, skill and caring." Both the proximal technical description and the distal explanation in terms of professionalism are correct. But there is a difference here.

Online publishing and the resurgence of commercialism in dentistry have brought about an avalanche of journals that promote dentistry as a bag of techniques. EBD is piling onto that movement with its semi-religious encomiums of scientific rigor. There are no journals that talk about what makes a good dentist. (Perhaps the implication is that one who "buys into" the latest techniques is the best dentist.) The literature identifies products and techniques by name and performs statistical tests to find which is best; dentists are counted in the journals as nameless noise in the statistical error variance, as are patients.

I have conducted research with colleagues that suggests this is a distorted way to look at it. Chambers, D. W., Leknius, C. and Reid, L. A general method for describing sources of variance in clinical trials, especially operator variance, in order to improve transfer of research knowledge to practice. *Journal of Prosthodontics*, 2009, 20 (1), 1-7, is one example. When fabricating a temporary crown, the nature of the operator accounted for one-third more of the variability in outcome than did the material used. Additionally, some practitioners could use either material and some could only manage with the best material.

It matters whether the dentist is fixated on making the right moves or getting the right outcomes. Technically excellent dental care is not the same as promoting the best oral health. I do not recall ever having seen a CE program that promoted oral health (as opposed to more advanced dental techniques). The ADA now has an ethics hotline. It is early in the game, but first reports are that the inquiries are mainly of the legal sort: "Would my colleagues disapprove if I failed to inform a specialist that I am having collection problems with a referred patient?" or, "Can I fire an assistant who tells patients negative things about the office?" So far no one has asked, "Do you have any suggestions for new things I could try to raise the overall level of oral health among my patients?" ■

The nub:

1. No batting champion looks at the proximal (bat); they look at the distal (fence).

2. Good dentists guarantee good techniques; good techniques may or may not make good dentists.

3. No dental supply house sells good dentistry.

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

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ADA: Dental Spending Remains Flat-lined

Based on new data released by the Centers for Medicaid & Medicare Services and published by the American Dental Association's Health Policy Resources Center, new research shows people spent about the same amount of money on their dental care in 2012 as they did in 2011.

National dental spending was $111 billion in 2012 — roughly the same as the previous year when adjusted for inflation.

In 2012, dental expenditures accounted for 4 percent of overall national health expenditures, down from a peak of 4.5 percent in 2000, the brief notes.

"Overall U.S. health spending during the past four years has grown at the slowest rates ever recorded in the 53-year history of the National Health Expenditure Accounts, reflecting the lagged effects of the recent economic recession," according to a news release from the ADA. The elderly continue to be the age group with the highest level of dental spending, driven primarily by gains in private dental benefits and higher demand for care.

"Recent projections of dental spending through 2040 suggest that while the aging of the population may act to increase total dental expenditure, downward trends in dental spending among younger age groups may counteract this effect, particularly as the baby boomer generation phases out," the authors wrote. "As a result, despite the anticipated increase in dental expenditures among older adults, growth in total dental spending is expected to be sluggish in the near future, with a 'new normal' emerging."

For more information, see the full research brief at ada.org/sections/professionalResources/pdfs/HPRCBrief_0114_1.pdf.

Study Suggests Education, Outreach Needed to Get Americans to Seek Dental Care

New research has found that providing people with dental insurance does not necessarily mean that they will use it and seek dental care, according to a study from the University of Maryland School of Dentistry.

The researchers examined data from the Health and Retirement Study of 2008, looking at older Americans who had dental coverage and those who didn't, and examining who was using dental care. They also looked at personal characteristics such as race, gender, marital status, age, health status and more, according to a news release. The scientists found that providing dental coverage to uninsured older Americans who do not tend to use dental care will not necessarily mean that, once insured, those people will seek dental care.

In the study, which is published online in the *American Journal of Public Health*, authors said that their research suggests outreach and education are needed to ensure that people value their dental health and use their coverage to seek appropriate dental care.

"You can't just hand people coverage and say, 'There, that's better,'" said Richard J. Manski, DDS, MBA, PhD, professor and chief of Dental Public Health at the University of Maryland School of Dentistry, in a news release. "You need to offer some inducements, some promotional campaign to change people's attitudes and beliefs. We hope this starts the process of a new way of thinking about the problem."

For more, see the study in the *American Journal of Public Health*, February 2014, vol. 104, no. 2, pp. e80-e87.

New Anti-tobacco Campaign for Teens

The U.S. Food and Drug Administration (FDA) recently launched a new public awareness campaign that focuses on the dangers of tobacco use.

The youth tobacco prevention campaign, "The Real Cost," launched on Feb. 11 and will run across multiple media platforms, including TV, radio, print and online for at least a year. The campaign targets at-risk youth ages 12-17 who are open to smoking or already experimenting with cigarettes.

According to the FDA, about 10 million youth in the United States currently fall into this category of being open to or already experimenting with cigarettes. Tobacco use is the leading preventable cause of disease, disability and death in the United States, responsible for more than 480,000 deaths each year. Every day in the United States, more than 3,200 youth under age 18 smoke their first cigarette — and more than 700 youth under age 18 become daily smokers, according to the FDA.

"The Real Cost" campaign will highlight the harmful effects of tobacco use with the goal of reducing the number of youth cigarette smokers ages 12-17 by at least 300,000 in three years.

The campaign will feature the following messages:

- See what your smile could look like if you smoke.
- Smoking cigarettes can cause yellow teeth, bad breath and gum disease.
- If you're playing with cigarettes, you're harming your teeth.
- Don't smile, smoking may stain your teeth.
- Smoking causes gum disease, which could cost you your teeth.
- Smoking causes bad breath, may stain teeth and causes gum disease that can lead to tooth loss.

The FDA expects the campaign to be a success, highlighting statistics from the Centers for Disease Control and Prevention that show "new tobacco prevention campaigns that reach 75 to 85 percent of the target audience within one year can expect to produce attitude and behavior change within two years if the time in market is adequately sustained."

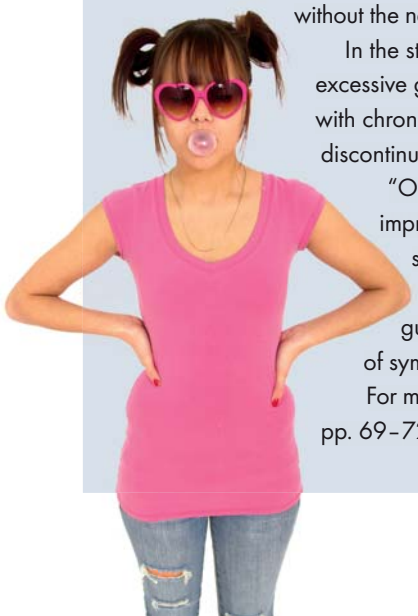
Dentists can use the FDA's stakeholder resource page or campaign information and customizable resources, such as posters, postcards and campaign flyers, in waiting rooms and clinics frequented by teens. All materials are available for free download and many will soon be available for ordering through the campaign's clearinghouse. The FDA also has suggested posts for social media related to the campaign.

For more information, visit www.fda.gov/therealcost or therealcost.gov.

Chewing Gum Responsible for Migraines in Teens

A team of researchers recently identified gum-chewing as a cause of migraine and tension headaches in adolescents, according to a study published in *Pediatric Neurology*.

Lead author Nathan Watemberg, MD, said his findings can be put to use immediately and that by advising teenagers with chronic headaches to simply stop chewing gum, doctors can provide many of them with quick and effective treatment, without the need for expensive diagnostic tests or medications.



In the study, researchers "evaluated the influence of daily excessive gum-chewing in older children and teenagers with chronic headache, emphasizing the impact of habit discontinuation and its reintroduction."

"Out of our 30 patients, 26 reported significant improvement, and 19 had complete headache resolution," said Watemberg in a news release. "Twenty of the improved patients later agreed to go back to chewing gum, and all of them reported an immediate relapse of symptoms."

For more, see the study in *Pediatric Neurology*, vol. 50, no. 1, pp. 69–72.

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FDA: Dentists Should Discontinue Prescribing High Doses of Acetaminophen

As a precaution to the risks of liver injury, the U.S. Food and Drug Administration (FDA) recently released a statement stating dentists and other health care professionals will need to limit the amount of drugs they are prescribing to patients that include acetaminophen.

The FDA is recommending "health care professionals discontinue prescribing and dispensing prescription combination drug products that contain more than 325 milligrams (mg) of acetaminophen per tablet, capsule or other dosage unit."

The statement claims "there are no available data to show that taking more than 325 mg of acetaminophen per dosage unit provides additional benefit that outweighs the added risks for liver injury."

The FDA plans to withdraw approval of "prescription combination drug products containing more than 325 mg of acetaminophen per dosage unit that remain on the market." According to the statement, a two-tablet or two-capsule dose is fine to prescribe to patients if appropriate. In this instance, a total dose of acetaminophen would be 650 mg (the amount in two 325-mg dosage units).

For more information, see the statement at www.fda.gov/safety/medwatch/safetyinformation/safetyalertsforhumanmedicalproducts/ucm381650.htm.

Fluoride in Water Does Not Increase Risk of Bone Cancer

Researchers at Newcastle University recently found that higher levels of natural or artificial fluoride in drinking water in the U.K. do not lead to a greater risk of primary bone cancer, according to a news release.

Authors of the new study, published in the *International Journal of Epidemiology*, analyzed 2,566 osteosarcoma and 1,650 Ewing's sarcoma cases during 1980 and 2005 and found fluoride levels in water have no impact on the incidence of either in people aged 0-49.

"This is the largest study that has ever been conducted examining the possible association between fluoride in drinking water and risk of osteosarcoma or Ewing sarcoma," said Richard McNally, BSc, MSc, DIC, PhD, in the news release.

"The findings from this study provide no evidence that higher levels of fluoride (whether natural or artificial) in drinking water in Great Britain lead to greater risk of either osteosarcoma or Ewing sarcoma," the authors concluded.

For more information, see the full study in the *International Journal of Epidemiology,* first published online Jan. 14, 2014.

Study Finds p16 Most Important Prognostic Variable in OPSCC

While p16 immunohistochemistry is known to be a surrogate marker for human papillomavirus positivity in oropharyngeal squamous cell cancers, the prognostic strength of p16 over traditional prognostic factors is not fully characterized, according to authors of a recent study in the journal *Clinical Oncology*. In the new study, authors reported that they "evaluated the clinical and demographic differences between p16-positive and -negative OPSCC and characterized its prognostic strength versus traditional prognostic factors."

"This study shows that p16 is the single most important prognostic variable in OPSCC, surpassing traditional prognostic factors for both cancer-specific survival and recurrence-free survival," the authors concluded, adding that "disease stage has no prognostic significance in p16-positive patients, highlighting the need for routine p16 assessment in OPSCC."

The research team found 92 percent of the OPSCC originated from tonsil and tongue base sites, and 61 percent were p16 positive. Patients with p16-positive OPSCC were younger, with lower alcohol and tobacco exposure, the study noted.

In multivariate analysis, the authors report p16 positivity was the strongest independent prognostic variable for cancer-specific survival (CSS), recurrence-free survival (RFS) and locoregional control (LRC).

For more information, see the full study in the journal *Clinical Oncology*, 2013, vol. 25, no. 11, pp. 630-638.

CDA Updates Radiation Safety Guide

The California Dental Association recently updated its *Radiation Safety in Dental Practice* guide, which contains the regulations applicable to dentistry and a template for completing a written safety program. All sources of radiation must have a copy of the radiation regulations and a written radiation safety program.

To ensure compliance with state radiation regulations, all dental practices, clinics and dental educational programs are being urged to obtain the recently updated guide, which can be downloaded for free at cda.org.

"Dentists have a responsibility to protect their patients and their staff and to make sure necessary exposures are kept as low as reasonably achievable (ALARA)," said CDA President James Stephens, DDS. "Familiarizing themselves with CDA's updated *Radiation Safety Guide* is one way dentists can ensure they're practicing safely."

With assistance from the Department of Public Health (DPH), dental school faculty members helped update the guide, which was first published in 1996. X-ray technology has changed considerably since then — digital systems are more common today and the use of cone beam computed tomography is increasing. However, the regulations themselves have changed little. Quality assurance regulations for X-ray film were adopted in 2012, and the DPH now requires all sources of radiation to have a written radiation safety program. Additionally, the use of protective aprons continues to be a requirement.

The guide reviews the responsibilities of the licensed dentist and X-ray machine owner, as well as the essential principles for reducing patient and occupational exposure to radiation. A table summary of the ADA/FDA radiographic prescription guide that was updated in 2012 is included. The use of portable X-ray units and CBCTs is addressed and a section on dental monitor display and image quality considerations has been added.

For more, see the updated guide at cda.org/Portals/0/pdfs/practice_support/radiation_safety_in_dental_practice.pdf.

Antibacterial Agent Boosts Toothpaste Effectiveness

A new review published in The Cochran Library has found that regular use of fluoride toothpaste containing triclosan and a copolymer reduces plaque, gingivitis and bleeding gums and slightly reduces tooth decay compared to fluoride toothpaste without those ingredients.

The review notes that there was no significant evidence that triclosan/copolymer toothpaste reduced the incidence of periodontitis more than toothpaste without the combination.

The team from the Cochrane Oral Health Group reviewed 30 studies published from 1990 to 2012 in which 14,835 participants were randomized to receive a triclosan/copolymer containing fluoride toothpaste or a fluoride toothpaste that did not include triclosan/copolymer. Their analysis of the combined data found a 22-percent reduction in plaque, a 22-percent reduction in gingivitis, a 48-percent reduction in bleeding gums and a 5-percent reduction in tooth decay compared to toothpaste with fluoride alone. No adverse reactions to triclosan or the copolymer were reported.

The news release also notes that most of the studies of toothpastes evaluated in the report were directly or indirectly supported by companies that make toothpaste.

For more information, see the review in the *Cochrane Database of Systematic Reviews*, 2013, Issue 12.

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Understanding Root Resorption With Diagnostic Imaging

Kalid Aziz, DDS, MS; Terry Hoover, DDS; and Gurminder Sidhu, BDS, DDS, MS

ABSTRACT This article presents the clinical, radiographic and histopathologic features of various types of tooth root resorption. Tooth resorption may occur in a tooth internally or externally with distinctively different treatment approaches for each type of resorption. Given that proper diagnosis of the type of resorption is important, the use of cone beam computed tomography (CBCT) and conventional 2-D intraoral images in evaluation of resorptive lesions is discussed.

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Conflict of Interest Disclosure: None reported.

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Conflict of Interest Disclosure: None reported.

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Conflict of Interest Disclosure: None reported.

Resorption of human oral hard tissue is described as the physiologic or pathologic dissolution of mineralized tissues in bone, dentin or cementum by osteoclastic-type cells. This process may occur in a tooth internally or externally. The treatment for internal and external resorption in a tooth is distinctively different. It is therefore very important to properly diagnose the nature and extent of the resorptive process prior to making any treatment decision. This paper discusses the clinical, radiographic and histopathologic features of internal and external root resorption. Several cases illustrating the use of cone beam computed tomography (CBCT) and conventional intraoral images in the evaluation of resorptive lesions are presented as well.

External Resorption

External root resorption is a process that leads to an irreversible loss of cementum and dentin. It has been observed in both vital and nonvital teeth.[1,2,3] The majority of these cases are asymptomatic and are found during routine radiographic or clinical examination.[1] There are two phases of external resorption. External resorption is initiated with the mechanical or chemical injury to the precementum covering the external surface of the root. Such injuries can result from dental trauma, surgical procedures, excessive pressure of an impacted tooth or tumor or chemical irritation following whitening procedures.[4,5,6] External resorption may be classified in two major categories,

one associated with injury followed by a healing process with cementum repair or osseous replacement (replacement or ankylotic resorption), and a second category in which the injury is followed by inflammatory stimulus of the periodontal apparatus or sustained by infection in the root canal. A discussion of these types of external resorption follows.

The first category of external root resorption occurs secondary to traumatic injury to the external root surface. This may either be a localized injury where the healing occurs with cementum repair or a diffuse injury where healing occurs by osseous replacement of the resorbed root. This replacement or ankylotic resorption may occur when the injury to the root surface is severe or an avulsed mature permanent tooth was kept extraorally with a dry time longer than one hour.[22, 23] Healing occurs without an intermediate attachment apparatus and the bone comes into contact with the root surface (dentoalveolar ankylosis). For mild injuries with less than 20 percent of the root surface involved, the process may be reversed and healing occurs from an abnormal attachment apparatus.[7,8] In more severe cases, the condition is progressive and will result in eventual tooth loss. During this process, cells of the alveolar bone replace the periodontal attachment and resorb the root. These ankylosed teeth do not have physiological mobility and this is recognized clinically by a metallic sound on percussion.[5] These teeth often appear in infraocclusion.[4] Radiographically, no radiolucent areas are present and lamina dura and periodontal ligament space are absent. The resorption site is blended with bone that presents radiographically as a "moth-eaten" appearance. There is no effective treatment available for dentoalveolar ankylosis. The rate of resorption is unpredictable. Ankylosed teeth may remain in function for several years, but when the loss of the tooth is inevitable, a permanent prosthetic replacement should be planned (**FIGURES 1A** and **1B**).

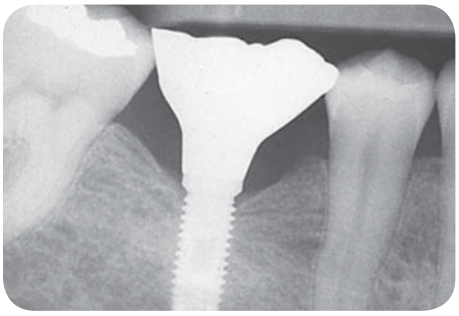

FIGURE 1A.

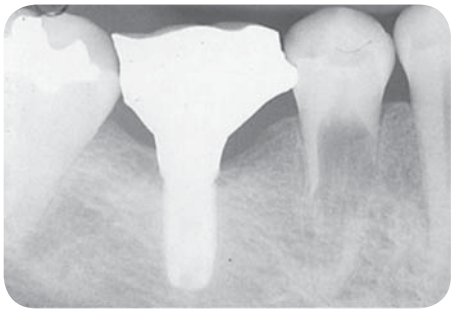

FIGURE 1B.

FIGURES 1A and **1B.** Replacement resorption associated with orthodontic movement. Process was asymptomatic to patient and was discovered radiographically by 2-D images when the prognosis was hopeless.

FIGURE 2A.

FIGURE 2B.

FIGURES 2A and **2B.** Resorption at the apex of a maxillary right central incisor due to orthodontic tooth movement. These two images allow comparison between a periapical image (2A) of the maxillary anterior teeth and a sagittal image from CBCT data (2B) of the same patient. The periapical 2-D image inadequately shows the extent of the root resorption on the maxillary right central incisor. Limited information of the buccolingual extent of root resorption is seen on the periapical image. The sagittal section from the CBCT data (2B), however, depicts the exact extent of the root resorption on the maxillary right central incisor. The periodontal ligament space is widened but the lamina dura is intact. Radiographically, the root appears to be shortened or blunted from the apex. Buccolingually the resorption is oblique, such that the buccal aspect of the root is higher compared to the lingual.

The second category of external resorption is caused by injury to external root surface with subsequent inflammatory stimulus in the periodontal apparatus or the root canal. Sources of this inflammatory stimulus may be pressure, pulp space infection or sulcular infection. Pressure resorption of permanent teeth is seen as a complication from orthodontic treatment, erupting teeth or a slow-growing benign neoplasm. The resorption process occurs with the stimulation of multinucleated cells in the apical third of the roots by continued pressure generated by orthodontic movement. Pressure root resorption can also be observed during eruption

FIGURE 3A.

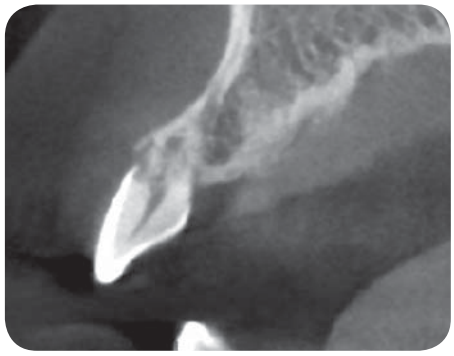

FIGURE 3B.

FIGURE 3C.

FIGURES 3A–3C. External root resorption on distal cervical aspect of maxillary right lateral. These images compare the periapical image (3A) and CBCT images (3B, 3C) of the maxillary right lateral incisor. On periapical image (3A), a radiolucent defect is noted on the distal cervical aspect of the maxillary right lateral incisor. The radiolucent defect does not appear to be extending to the pulp canal. The resorption appears to be limited to the distocervical aspect. Figures 3B and 3C show axial and sagittal CBCT images of the same patient. Note the discontinuation of the periodontal ligament space and involvement and extension of the resorptive process into the pulp canal. The exact extent of resorption was not depicted on the periapical image, while CBCT images show extensive resorption of the buccal and distal aspects of the root in the cervical region of the maxillary right lateral incisor.

of permanent dentition, especially of maxillary canines affecting lateral incisors and mandibular third molars affecting mandibular second molars. Teeth are asymptomatic and the vitality is unaffected unless there is a disruption of the blood supply because the pressure of the orthodontic treatment is extremely high or the erupting tooth or tumor is in proximity to the apical foramen.[4] Radiographically, orthodontic pressure resorption is located in the apical third of the root as previously mentioned, and no signs of radiolucency can be observed in the bone (**FIGURES 2A** and **2B**).

External resorption may also occur as a consequence of infection or necrosis of the pulp. Bacterial byproducts escaping from the infected dentinal tubules may become the inflammatory stimulus causing further root and bone resorption by osteoclastic activity and cellular scavenging (phagocytosis) of tissue debris.[4,7] Clinically, in the early stages of this process, teeth are usually asymptomatic, but as the resorption progresses, teeth may become symptomatic and a periradicular abscess may develop along with tooth mobility. Radiographically, it appears as an irregular radiolucency on the surface of the root. Early removal of the necrotic or infected pulp followed by appropriate endodontic treatment may effectively arrest this type of resorption. Calcium hydroxide is often considered the intracanal medicament of choice before final obturation because of the antibacterial property and high pH.[6,7] Other alternative procedures have been described in the literature as effective treatment for root resorption, such as mineral trioxide aggregate and Activ Point (Roeko, Langenau, Germany). Activ Point, with a content of chlorhexidine 5%, has shown a stronger antibacterial effect than calcium hydroxide (**FIGURES 3A–3C**).[4,9,10]

A progressive external inflammatory resorption may occur following injury at the cervical area of the tooth (often called cervical resorption). The injury associated with the cementum occurs just apical to the epithelial attachment.[11] The injury may result from dental trauma, chemical irritation after internal bleaching, orthodontic treatment or periodontal treatment.[7,12,13] The dentin is more likely to be unprotected in the cervical area where scanning electron microscopic studies have demonstrated that dentin exposure at the cementoenamal junction (CEJ) occurred in about 18 percent of teeth in general and in 25 percent of anterior teeth in particular.[14,15] In addition, the same tooth may have different CEJ characteristics, presenting dentin exposure on one side while the other sides are covered with cementum, making the exposed dentin surface more susceptible to the resorption process.[14,15] Initially, following small damage to the cementum, the resorbing cells as well as the bacteria from the periodontal sulcus penetrate into the root dentin. This bacterial contamination from the periodontal sulcus may result in the inflammatory stimulus for the resorbing cells. Initially, the resorptive process spreads around the root in an irregular fashion without invading the pulp space.[4,7,16] As this process progresses, the root canal and the adjacent alveolar bone may become involved. If the resorptive process spreads into the crown, a pink discoloration may be visible through the enamel of the crown. Radiographically, cervical root resorption appears as a radiolucent defect

at the cervical level. This radiolucency may extend into the radicular or coronal aspect as finger-like irregular projections. The pulp canal is usually intact. In a more advanced stage, the radiolucency may be observed in the alveolar bone adjacent to the resorption lacunae of the dentin.

With no pulpal involvement, the diagnosis for Case 4 (**FIGURES 4A–4D**) was invasive cervical resorption on the maxillary right central incisor. This information is important for the treatment plan and outcome. Various treatment modalities have been tried to treat invasive cervical root resorption with limited success. Treatment may involve exposing the resorption area either orthodontically or surgically to remove the granulation tissue, followed by the restoration of the defect with either amalgam or resin composite. Root canal treatment is necessary when the resorptive defect involves the pulp.[7,12,13] It is recommended to monitor this clinically to determine if the resorptive process has been arrested.[4]

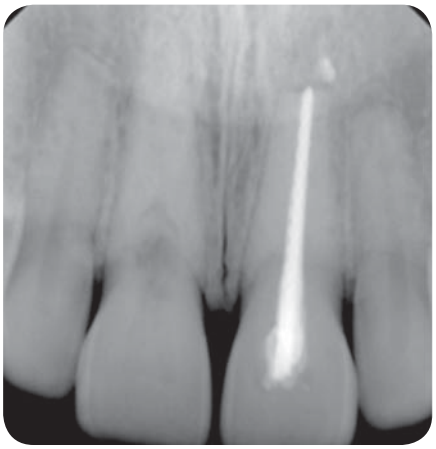

FIGURE 4A.

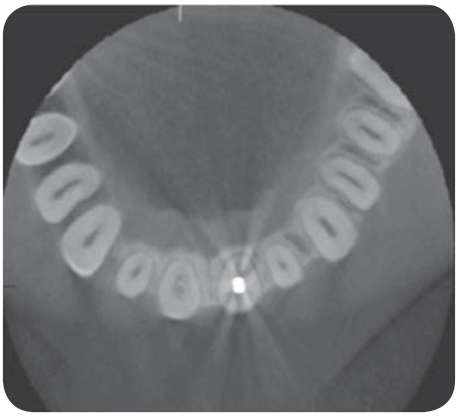

FIGURE 4B.

FIGURE 4C.

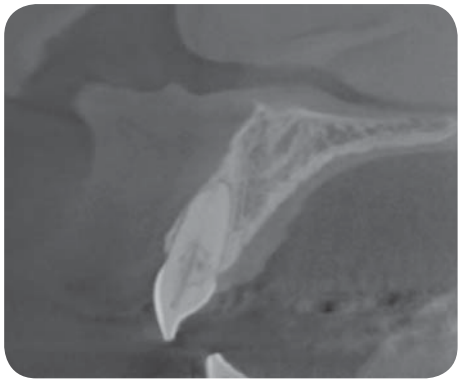

FIGURE 4D.

FIGURES 4A–4D. Example compares 2-D and CBCT images in evaluating cervical resorption. In the periapical image (4A), it was difficult to establish if there was an internal or external resorptive process. In the CBCT images (4B, 4C, 4D) on the same patient, however, the entire extent of the resorptive process was visualized. These CBCT images depict clearly that the resorptive process is not encroaching the pulp, establishing the extent of the resorption. On the periapical image, a small area of radiolucency is noted superimposed on the cervical aspect of the pulp canal on the maxillary right central incisor. It is difficult based on this image to differentiate between the internal versus external root resorption. No periapical radiolucency is noted on this tooth. The CBCT images of the same tooth shows the resorptive area to be clearly located in the dentin and not involving the pulp. The CBCT images show that the resorptive lesion is external and extending to the mid-root region.

Internal Resorption

Internal resorption is caused by damage to the predentin and odontoblastic layer, which can lead to exposure of the mineralized dentin. Loss of predentin protecting the internal dentin wall is important for initiating the internal resorption.[17] This usually occurs from chronic irritation, such as bacteria entering the pulp, often from trauma.[11,18] The internal resorption process, however, is a more rare finding in permanent teeth in the case of trauma than is external resorption because the internal dentin wall is more protected than the external cementum and attachment.[11] Once exposed, the mineralized dentin wall can be resorbed by multinucleated cells termed dentinoclasts. The ongoing inflammatory process within the pulp stimulates the dentinoclasts to continue their resorptive process as long they receive blood supply from vital apical pulpal tissue. The bacteria invading the pulp may result in some areas of the pulpal tissue degenerating, often in the coronal portion. Until and unless the apical pulpal tissue with its blood supply is destroyed, the pathologic resorptive activity will continue. When a tooth is discovered to be undergoing inflammatory internal resorption, immediate endodontic treatment is required to eliminate the remaining vital apical tissue sustaining the clastic activity.[11]

Unfortunately, the damage from the internal resorptive activity within a tooth may be in advanced stages before clinical signs and symptoms appear. In many cases, the root structure may be so damaged that the tooth may not be salvageable

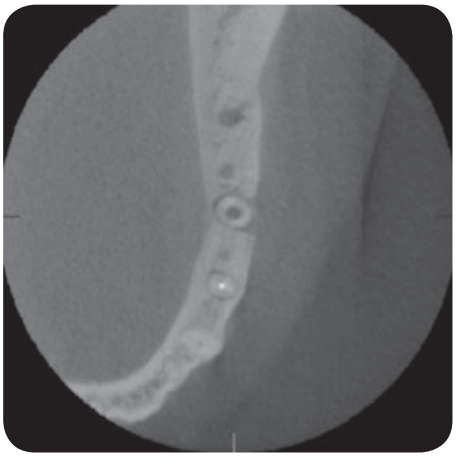

FIGURE 5A.

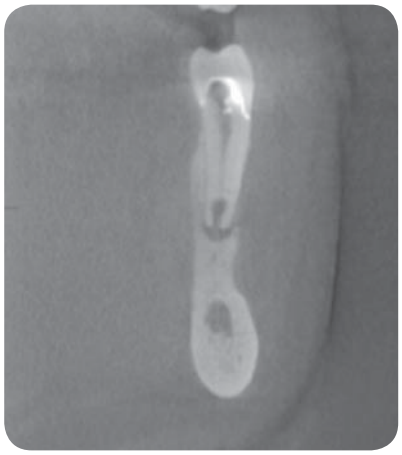

FIGURE 5B.

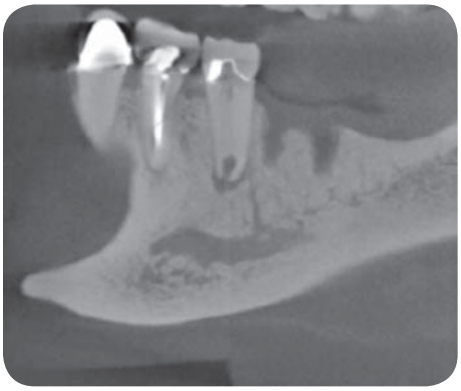

FIGURE 5C.

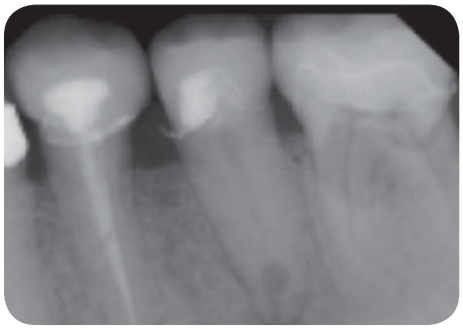

FIGURE 5D.

FIGURES 5A–5D. Images depict internal root resorption as well-defined round area in the apical third of the root of mandibular left second premolar. Axial, coronal and sagittal CBCT images 5A, 5B and 5C show the resorptive process is expanding the pulp chamber in the apical third of the root. The relationship of the inferior alveolar nerve canal is visualized on figures 5B and 5C. The 2-D periapical image (5D) of the same mandibular left second premolar gives less diagnostic information.

with current techniques. One sign, often called "pink spot,"[19] seen in the crown of a tooth undergoing internal resorption is relatively rare. This pink color is the result of granulation tissue showing through the surface of the enamel. Tenderness on palpation over the apex of a tooth (from periapical inflammation) may or may not be present. Pulpal testing with thermal or electric may be normal. Radiographic detection, therefore, can be essential in early diagnosis of internal resorption. Furthermore, because both the predentin and precementum layers, with their adjacent odontoblastic and cementoblastic layers, respectively, are believed to be protective barriers against the resorptive root inflammatory processes, internal and external resorption do not usually exist in the same lesion.[19] Radiographic differentiation between the two processes is therefore possible, which is essential for proper treatment decisions. The radiographic appearance of internal resorption has distinctive features. It is often seen as a uniform, symmetrical radiolucency. The lesion has smooth borders and is oval or round in its shape.[20,21] In contrast, external resorption as we have referenced previously tends to have an irregular pattern radiographically (**FIGURES 5A–5D**).

Conclusion

Once root resorption is suspected, it must be determined if it is external or internal resorption. The extent of the resorptive lesion must also be well imaged to plan any proposed treatment. CBCT can play an important role here since, as we have seen, 2-D imaging often does not depict the true nature or extent of the resorptive process. Although there is no treatment for extensive replacement/ankylotic external resorption, external resorption from infective inflammation, if caught early, may be managed by exposing the resorption area and removing granulation tissue and restoring the defect. Internal resorption, when diagnosed early, may be treated endodontically to eliminate the remaining vital tissue and its blood supply sustaining the dentinoclastic activity. ■

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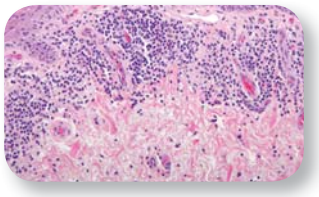

Topical Tacrolimus in the Management of Oral Lichen Planus: Literature Review

Shilpa P S, MDS; Rachna Kaul, MDS; Suraksha Bhat, MDS; Sanjay C J, MDS; and Nishat Sultana, MDS

ABSTRACT Tacrolimus is an immunosuppressive property approved for the treatment of atopic dermatitis. Studies have shown that topical tacrolimus is effective for a broad spectrum of mucocutaneous diseases, including oral lichen planus. The objective of this article is to review the pharmacology of tacrolimus, its usage in oral lichen planus, adverse effects and advantages of tacrolimus over other conventional drugs, thus making it a popular and alternative drug for the treatment of lichen planus.

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Tacrolimus (previously known by its experimental name, FK506) is a macrolide molecule with an immunosuppressive property. Tacrolimus is produced by Streptomyces tsukubaensis, a bacterium found in the soil near Tsukuba, Japan. This drug is mainly used after allogenic organ transplant to reduce the risk of organ rejection. Topical preparation of tacrolimus is approved for the treatment of atopic dermatitis in adults and children.[1,2] Topical tacrolimus is effective for treating a broad spectrum of mucocutaneous diseases, including oral psoriasis, Crohn's disease, exfoliative cheilitis, oral lichen planus, graft versus host disease, pemphigus vulgaris, paraneoplastic pemphigus, bullous pemphigoid and cicatricial pemphigoid.[3] Studies have shown the efficacy of topical tacrolimus in curing the erosive form of lichen planus, which was resistant to conventional forms of treatment.[4,5] The objective of this article is to review the pharmacology of tacrolimus, its usage in oral lichen planus, adverse effects and advantages of tacrolimus over other conventional drugs, thus making it a popular and alternative drug in the treatment of lichen planus (**FIGURE 1**).

Tacrolimus belongs to a group of calcineurin inhibitors produced by a type of bacterium, Streptomyces tsukubaensis.[6] Calcineurin is a calcium-binding cytoplasmic protein that is involved in T-cell activation and proliferation by dephosphorylation of the nuclear factor of activated T-cells (NFAT), which lead to the cascade of cytokine gene transcription, such as interleukin-2, interleukin-4, interferon-α and tumor necrosis factor α. Tacrolimus binds to FK506, and the complex further binds to calcineurin to inhibit T-lymphocyte activation by inhibiting the phosphatase activity of calcineurin.[4,7,8] It also inhibits the function of Langerhans cells and the

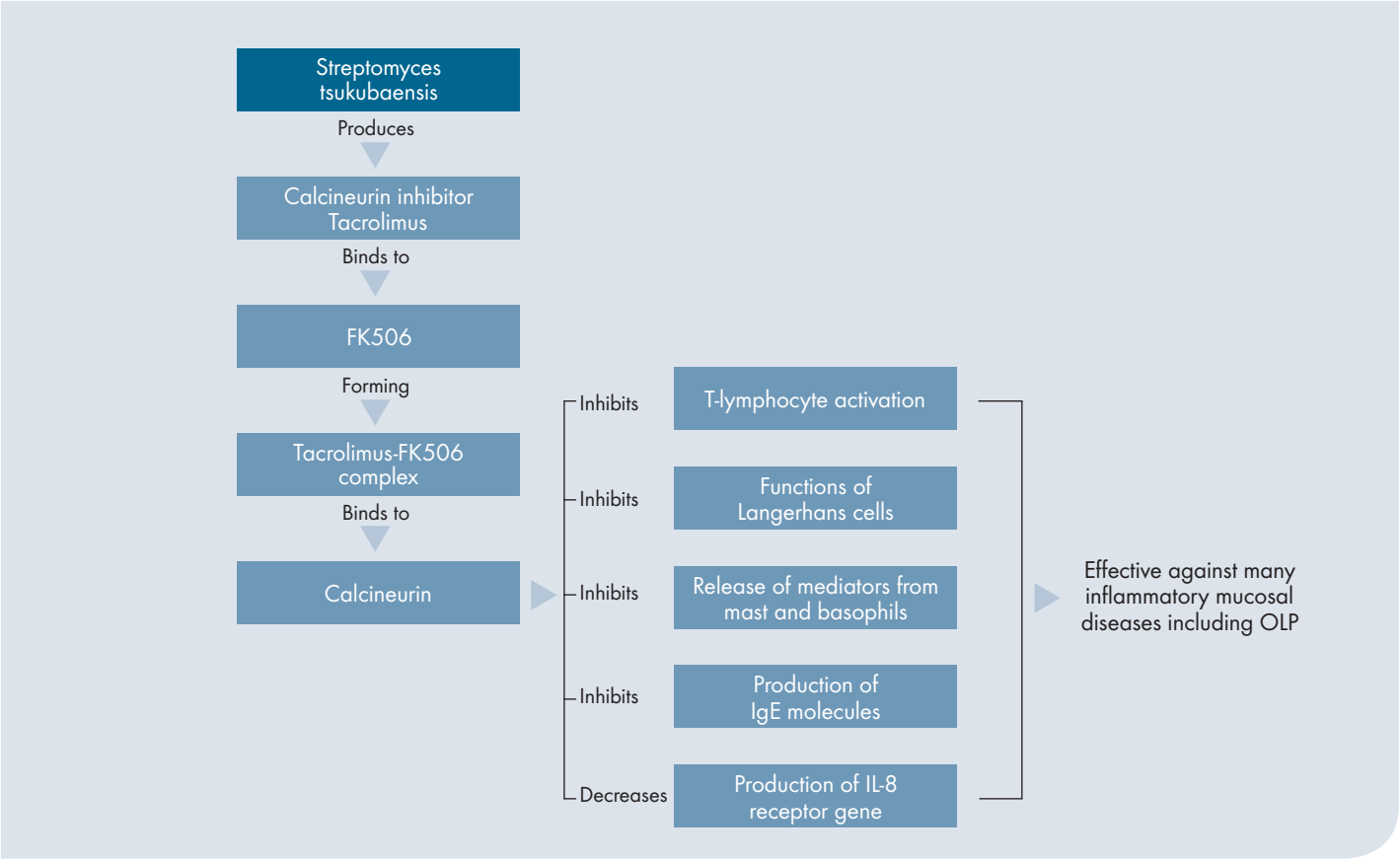

FIGURE 1. Pharmacotherapy of tacrolimus.

release of mediators from mast cells and basophils.[4,9] Tacrolimus also decreases the production of IL-8 receptor genes and inhibits the production of receptors for IgE molecules.[10] Because it affects a variety of interleukins, it can be effective in the treatment of wide varieties of inflammatory mucosal diseases.

Topical Treatment of Oral Lichen Planus With Tacrolimus

Lichen planus is a chronic inflammatory mucocutaneous disease that affects the skin, oral mucosa (oral lichen planus or OLP), genital mucosa, scalp and nails. The term lichen planus was first introduced by Erasmus Wilson in 1869.[11] Lichen planus affects 0.5 percent to 1 percent of the world's population.[12] Though it can be seen at any age, most cases occur between the ages of 30 and 60 years, with female predominance.[13] Etiology of OLP is unknown, but the immunologic system plays a leading role in the pathogenesis. It is well documented that OLP represents a cell-mediated immune response with infiltrating cell population composed of both T4 and T8 lymphocytes. There is abnormal T-cell-mediated immune response in which basal epithelial cells are recognized as foreign because of changes in the antigenicity of their cell surface.[14] Clinically, lesions are symmetrical, involving the buccal mucosa, tongue, gingiva, floor of the mouth, lips and palate. OLP appears as hyperkeratotic striae (Wickham's striae) or plaque and is asymptomatic in most cases, except for atrophic, erosive and bullous forms wherein the symptoms range from mild discomfort to a severe burning sensation.[15] It is considered a potentially malignant condition, with frequency of malignant transformation ranging from 0 percent to 5.3 percent with the highest rate noted in erythematous and erosive lesion.[16,17]

A variety of treatment modalities has been employed to treat symptomatic OLP, but complete resolution is difficult to achieve. It is characteristically associated with a persistent clinical course and is resistant to most conventional treatments. **TABLE 1** summarizes treatment options for oral lichen planus. Several studies have demonstrated successful treatment and management of OLP with topical tacrolimus.[1,5,7,18,19]

In an open-label, prospective, noncomparitative study, Olivier et al. administered topical tacrolimus to eight patients with OLP. Seven out of eight patients had significant improvement and one patient showed no improvement. There was relapse of OLP in all the patients nine to 12

TABLE 1

Various Treatment Modalities Employed in the Treatment of OLP

Type of Drug	Mechanism of Action	Adverse Effect
Corticosteroids	Anti-inflammatory and immunosuppressive property	Blanching of mucosa, delayed wound healing, hypopigmentation Electrolyte imbalance, hypertension, hyperglycemia, osteoporosis, increased susceptibility to infection, hirsutism
Retenoids	Anti-keratinizing and immunomodulatory effect	Dryness of skin and mucosa, rashes, itching, partial hair loss
Cyclosporine	Inhibits T cell activation, proliferation, inhibits lymphokine production and release of interleukin 2	Renal toxicity, neurotoxicity, hirsutism, gingival enlargement
Levamisole	Immunomodulatory effect and alters natural course of chronic recurrent inflammatory disease	Nausea, vomiting, headache and agranulocytosis
Azathioprine	Has anti-inflammatory property and decreases antibody production	Leukopenia, thrombocytopenia and GI toxicity
Dapsone	Anti-inflammatory and immunomodulatory effect	Hemolysis, headache
Mycophenolate mofetil	Selective inhibitor of purine cycle in lymphocyte	Reduces patient's immunity

TABLE 2

Treatment of OLP by Topical Tacrolimus by Different Researchers

Author	Reference	Diagnosis	Type of Tacrolimus	Patients Treated	Response	Adverse Effects
Lener EV et al.	31	Erosive OLP Cutaneous LP Hepatitis C positive	0.1% topical tacrolimus twice daily	1	Complete resolution in one month	Not reported
Olivier V et al.	18	Erosive OLP	Tacrolimus mouthwash 0.1 mg/mL of distilled water Four times a day for six months	8	Seven out of eight patients reported with complete resolution	Tingling Oral dryness Recurrence of herpes labialis
Hodgson TA et al.	19	Erosive or ulcerative OLP	0.1% tacrolimus ointment	50	14 percent – complete resolution 80 percent – partial resolution 6 percent – no benefit	Burning sensation Taste disturbances
Byrd JA et al.	1	OLP	0.03% and 0.1%	37	33 (89 percent) – symptomatic improvement 31 (84 percent) – partial to complete lesion clearance	Burning sensation Tingling sensation
Arguelles AR	5	Erosive OLP Hepatitis C Genital LP	0.1% topical tacrolimus ointment	1	Clinical and macroscopic improvement	Not reported
Vente C et al.	2	Erosive OLP Cutaneous LP Genital LP	0.1% tacrolimus	6	Three – complete resolution Two – good improvement One – little improvement	Two patients reported with slight burning sensation
Eckardt A et al.	30	Erosive OLP	0.1% tacrolimus ointment	18	94 percent – major symptom relief 6 percent – no change of symptoms	Burning sensation

months after treatment cessation, which required treatment with topical/systemic corticosteroids.[18] Hodgson et al. demonstrated the efficacy and safety of topical tacrolimus for the treatment of 50 patients with OLP and suggested that 0.1% topical tacrolimus is an effective means of controlling the signs and symptoms of OLP and has no notable adverse effects.[19] Byrd et al. surveyed patients treated with topical tacrolimus for symptoms of OLP. Thirty-three (89 percent) out of 37 patients reported with lesion clearance, with noted improvement within one month of topical tacrolimus use. Although 12 (32 percent) patients reported with adverse effects, long-term use did not show any adverse effects. The authors concluded that topical tacrolimus is effective in the treatment of OLP, but effect is temporary and on discontinuation of tacrolimus, OLP flared up.[1] A meta-analysis of case-control studies found a statistically significant association between hepatitis C virus (HCV) infection and lichen planus, although there is no known explanation for this association.[20,21] Topical tacrolimus was found to be effective in reducing the symptoms and resolving the lesion in OLP patients associated with HCV infection.[22]

TABLE 2 depicts the treatment of OLP by topical tacrolimus by different researchers. We have also encountered promising results with the use of topical tacrolimus in some of our patients with OLP. **FIGURES 2** and **3** represent before and after topical tacrolimus therapy in two of our patients. In the majority of cases, the symptoms decrease within the first month of initiation of tacrolimus treatment. However, the recurrences start from six to 12 months after the cessation of treatment. Therefore, it is recommended to use topical tacrolimus intermittently thereafter.

FIGURE 2A. Before topical tacrolimus therapy.

FIGURE 2B. After topical tacrolimus therapy.

Adverse Effects

The most common side effects with the use of topical tacrolimus are a burning sensation, irritation and tingling sensation especially if used over a wide area and on initial applications. Less commonly reported adverse effects include flu-like symptoms, headache and taste changes. Byrd et al. used topical tacrolimus for 37 patients with erosive and reticular OLP. Twenty-five (68 percent) patients reported with no adverse effects, while 12 other patients reported irritation (11 percent), burning sensation (15 percent), tingling (8 percent) and taste change (17 percent). With systemic tacrolimus, the principal adverse side effects are nephrotoxicity, neurotoxicity and gastrointestinal disturbances.[1]

Carcinogenic Potential of Topical Tacrolimus

In 2005, the Food and Drug Administration (FDA) issued a black box warning because of a potential cancer risk, especially squamous cell carcinoma and lymphoma, with use of tacrolimus. The reasons for recommending a black box warning were based on an animal study indicating a risk for malignant transformation. Moreover, indiscriminate off-label usage of tacrolimus particularly in the under 2-year age group where systemic absorption may be more significant prompted the FDA to advise weighing up the risks of treatment against the benefits and stressed that approval was for short-term intermittent treatment of patients unresponsive or intolerant to other agents.[23,24] Also, OLP has an inherent potential risk to undergo malignant transformation.[25] Furthermore, lack of long-term studies on the safety of tacrolimus in the treatment of OLP impedes the usage of topical tacrolimus for prolonged duration.

Three hypothetical mechanisms have been proposed through which topical calcineurin inhibitors (tacrolimus and pimecrolimus) could increase the risk of malignancy: 1) Tacrolimus inhibits apoptosis in various cell types, inhibitors inhibit DNA repair and reduce apoptosis in healthy human epidermal keratinocytes following UV-B irradiation thus, they may behave as tumor promoters in precancerous cells; 2) The development of local immunosuppression at the application site and/or 3) systemic immunosuppression due to systemic absorption. Preclinical studies have shown that topical calcineurin inhibitors did not exhibit mutagenic, genotoxic or photocarcinogenic effects.[26,27,28]

After reviewing the literature regarding the controversy of the association between topical pimecrolimus and tacrolimus and the development of tumors, Perez JS concluded that currently, there is no scientific evidence of an increased incidence of skin cancer, lymphomas or systemic immunosuppression in those patients who use or have used topical calcineurin inhibitors as the published studies lack adequate number of patients and/or the follow-up time is short enough

FIGURE 3A. Before topical tacrolimus therapy.

FIGURE 3B. After topical tacrolimus therapy.

to conclude that topical use of calcineurin inhibitors might be associated with the reported cases of skin cancer and lymphoma. However, the possibility of long-term risks cannot be excluded.[29] Choudari et al. reviewed safety and efficacy of topical tacrolimus in several mucosal lesions that are chronic and relapsing in nature and believed that patients are likely to use tacrolimus for a long period of time. For this reason, the FDA issued the warning, although there is no concrete evidence of risk in humans. In accordance with the current data, Choudari et al. concluded that topical tacrolimus is a safe and efficacious alternative to topical steroids, however further studies, especially with long-term follow ups are required to clarify the efficacy and safety profile.[30]

There has been a report of an increased risk of development of malignancies (lymphomas and squamous cell carcinomas) with the use of systemic tacrolimus.[10] But, a definite causal relationship between development of malignancies and use of topical tacrolimus topical has not been clearly established. Few authors have also reported the development of cancer after topical use of tacrolimus.[31,32,33] Tacrolimus has been shown to have an impact on cancer-signalling pathways such as the MAPK and the p53 pathway. Becker observed a reduction of Bax expression in epithelial cells in some areas of tacrolimus-treated mucosa and reduction was also found in cancer cells.[31] However, long-term human studies extending 10 years or more may be required to ascertain this suspected causal relationship between topical use of tacrolimus and development of malignancies.

Advantage of Tacrolimus Over Other Conventional Treatment Modalities

Various modalities used, such as corticosteroids and cyclosporine used in the treatment of OLP, have numerous adverse effects, which leads to the discontinuation of the treatment. Moreover, OLP is resistant to most of the treatment modalities. Tacrolimus has powerful immunomodulatory/immunosuppressive activities. Unlike corticosteroids, topical tacrolimus does not cause either skin atrophy or telangiectasia even with long-term use, which is the major advantage of this drug. Possible explanation is that tacrolimus does not affect endothelial cells, keratinocytes and fibroblasts, and thus does not affect collagen synthesis and skin thickness.[34,35,36] Topical tacrolimus blocks Langerhans cell function more potently than betamethasone valerate, a mid-strength corticosteroid.[37,38] As compared to cyclosporine, tacrolimus exerts an activity that is 10 to 100 times higher than that of cyclosporine. Tacrolimus is a smaller molecule, which helps with better penetration into the skin and the mucosa than cyclosporine.[7]

The systemic absorption of tacrolimus after topical application has been found to be very low and immunosuppression following topical tacrolimus is minimal. Hodgson et al. quantified whole-blood tacrolimus concentration levels in patients receiving topical tacrolimus in OLP patients. Fifty-four percent of patients were detected with quantifiable whole-blood tacrolimus, but they were transient isolated occurrences not associated with any adverse clinical event and not correlated with the surface area of erosion/ulceration being treated. Only 10 percent of patients had tacrolimus blood levels greater than 5 µg/L.[19] No increased frequency or severity of local or systemic infection was reported while using topical tacrolimus.

Dosage and Cost

Tacrolimus ointment is produced under the brand names Protopic, Prograf and Advagraf. It comes in 0.03% formulation for children and 0.1% formulation for adults. The posology varies from one to four times a day according to different studies. The average cost of a 30-g tube is $54.37 for the 0.03% ointment and $58.12 for the 0.1% strength.[39]

Conclusion

Tacrolimus can be effective, safe and an alternate treatment modality for the management of OLP with minimal adverse effects and can be considered especially when the lesions are resistant to the conventional treatment. Topical tacrolimus may help to release the stress and improve the quality of life of patients suffering from OLP. Most of the patients responded to the topical tacrolimus both clinically and symptomatically within one month of therapy, but frequently relapse was seen within six to 12 months of treatment cessation. Prolonged or intermittent use of topical tacrolimus ointment in patients with symptomatic OLP may be recommended with constant

monitoring, but remains to be clearly established in large, well-designed clinical studies. Topical tacrolimus treatment seems to be effective in several other oral disorders, but this must be proven. This gives opportunities for future research that can be conducted to determine the long-term effects and efficacy of topical tacrolimus use for lichen planus as well as other mucosal lesions. ■

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Cone Beam Computed Tomography Utilization by Graduates From Two Orthodontic Programs in the Pacific Coast Region

Shibani Rajadhyksha, DDS; Gerald Nelson, DDS; and Snehlata Oberoi, DDS

ABSTRACT Evaluate the use of cone beam computed tomography among orthodontists in two areas of the Pacific Coast region via an electronic survey sent to the chairs of the orthodontic programs at the University of California, San Francisco, and A.T. Still University in Mesa, Ariz. The survey link was subsequently forwarded to each program's alumni. Overall, 85.7 percent of the orthodontists reported using CBCT scans. The scans were primarily used for impacted/supernumerary teeth and temporomandibular joint disorders analysis.

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Cone beam computed tomography (CBCT) has caused a paradigm shift in imaging in dentistry, allowing visualization of tissues and structures in three dimensions. In orthodontics, the use of CBCT systems has offered many advantages with respect to diagnosis and treatment planning. Some examples of CBCT applications include visualization of impacted teeth, airway analysis, temporomandibular joint (TMJ) evaluation, virtual planning for implant placement, simulation of orthognathic surgery, assessment of periodontal bone loss, detection of root fracture and treatment planning in craniofacial/cleft lip and palate cases.[1-7] Utilization of 3-D radiographs has not been limited to the research and academic settings. There has also been a steady adaptation of CBCT usage in the private practice sector due to recent graduates who had exposure to CBCT during their training, experienced clinicians who learned about it through continued education and community-based imaging centers that provided access to the scanners.

Numerous studies have demonstrated that CBCT-derived images have improved the accuracy and reliability for detection of cephalometric landmarks when compared to 2-D digital cephalograms.[8] Although CBCT imaging provides undistorted, high diagnostic quality images, there is a mounting concern among clinicians about radiographic exposure dosages. Studies have demonstrated that the radiation dosage

from CBCT use in orthodontics is higher than that of conventional orthodontic radiographs, although significantly lower than medical computed tomography scans.[9] The ADA Council on Scientific Affairs recommends utilizing techniques that would reduce the amount of radiation received during dental radiography, also known as the "as low as reasonably achievable" (ALARA) principle. Noble et al. demonstrated that a majority of orthodontic residents were either not interested in (17 percent) or were unsure (47 percent) about the prospect of utilizing CBCT scans in their practices.[10] The extent to which CBCT scans are currently being utilized in orthodontic practices remains unknown.[11] It is important to understand the benefits, risks and alternatives of CBCT usage. The purpose of this study is to analyze current trends of CBCT use among orthodontists in the Pacific Coast region and to discuss possible future CBCT implementation trends.

Materials and Methods

The use of CBCT among orthodontists was evaluated using an electronic survey created through Google Docs. The survey included 14 questions in a logical section format in which only applicable questions, based on previous responses, were used. These sections evaluated demographic location, CBCT scan accessibility, clinical usage practices, effect on diagnosis and treatment planning, patient comfort, radiation dosage concerns, additional training requirements, responsibility for radiographic interpretations and future implementation plans. All questions were multiple choice, with some questions allowing the responder to enter additional comments. This pilot study focused on orthodontists from orthodontic residency programs at the University of California, San Francisco, and A.T. Still University. The survey was distributed using a personalized email link sent by the chairs of the orthodontic residency programs to the programs' alumni. Survey responses were collected over a three-month period. Survey data were compiled and analyzed using the analysis tool in Google Docs and Excel.

Results

The total number of responses was 56 — 46 (20.8 percent) from UCSF alumni and 10 (13.3 percent) from A.T. Still University alumni. The overall response rate was 18.9 percent.

A large majority of the respondents, 85.7 percent, reported that they use CBCT in their practices. However, only 16.7 percent own a CBCT machine in their offices (**FIGURE 1**). A majority of CBCT users, 56.2 percent work in a solo practice. CBCT was used as a primary diagnostic tool in less than 50 percent of cases and used specifically to diagnose impacted/supernumerary teeth and TMJ disease. Other specific conditions for which CBCT was used included craniofacial anomalies, airway analysis, orthognathic surgery and interdisciplinary cases (**FIGURE 2**).

When used, CBCT either significantly improved (33.3 percent) or improved (60.4 percent) the clinician's ability to diagnose and treatment plan (**FIGURE 3**). The majority of the CBCT users (72.9 percent) always altered their treatment plans based on the scans (**FIGURE 4**). Responsibility for interpretation of CBCT scans was equally shared by the orthodontist and the radiologist. CBCT users listed the source of their training as being primarily continuing education sources, university education and self education. Of CBCT users, 54.2 percent altered the field of view based on particular case requirements, while 27.1 percent kept the same field of view for every patient (**FIGURE 5**). The majority of CBCT users, 66.7 percent, reported that their patients were concerned about radiation exposure.

Among the respondents who did not use CBCT, the majority used panoramic and cephalometric radiographs to diagnose and treatment plan. The cost of the equipment was listed as a primary limiting factor for using CBCT.

Discussion

We found that the majority of respondents were using CBCT for diagnosis and treatment planning. While CBCT was generally not used as a primary diagnostic tool, it was used for the specific diagnosis of impacted/supernumerary teeth. Hodges et al. recommend CBCT in instances of unerupted tooth with delayed eruption or a questionable location, severe root resorption as diagnosed with a periapical or panoramic radiograph or a severe skeletal discrepancy.[11] Smith et al. surveyed orthodontic residency programs in the United States and Canada to access current trends of CBCT use. They concluded that in circumstances in which CBCT was used for specific diagnostic purposes, all of the programs used it for localization and identification of impacted canines.[12] Rossini et al. conducted a literature review to analyze the diagnostic accuracy and efficacy for detecting impacted canines using CBCT. They concluded that CBCT is superior to other radiographic modalities for the visualization of the position and complications of impacted maxillary canines.[13] Haney et al. reported that the clinician's confidence of the accuracy of diagnosis and treatment plan for impacted maxillary canines was statistically higher when using CBCT images ($P < 0.001$).[14] After viewing the 3-D CBCT images, statistically significant changes were made to 27 percent of teeth that were planned to be left, recovered or extracted with 2-D radiographs. In addition, the authors confirmed that panoramic radiography is not a reliable method for localization of impacted canines.[14]

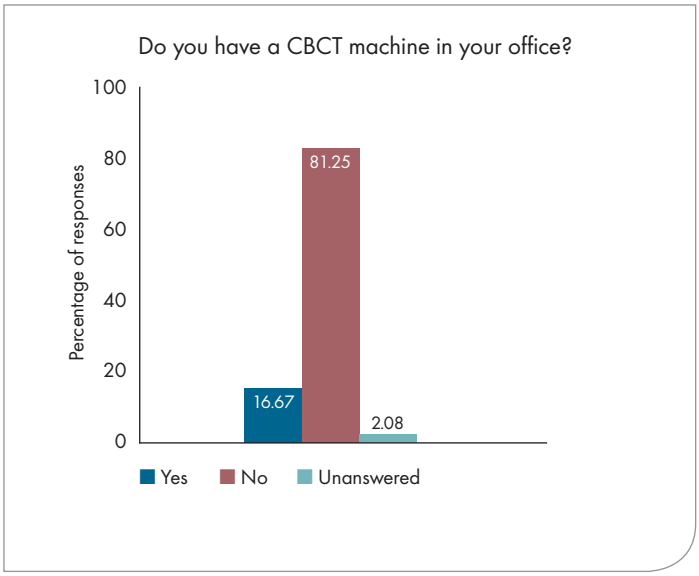

FIGURE 1. Percentage of CBCT scan users that own a CBCT machine in their practices.

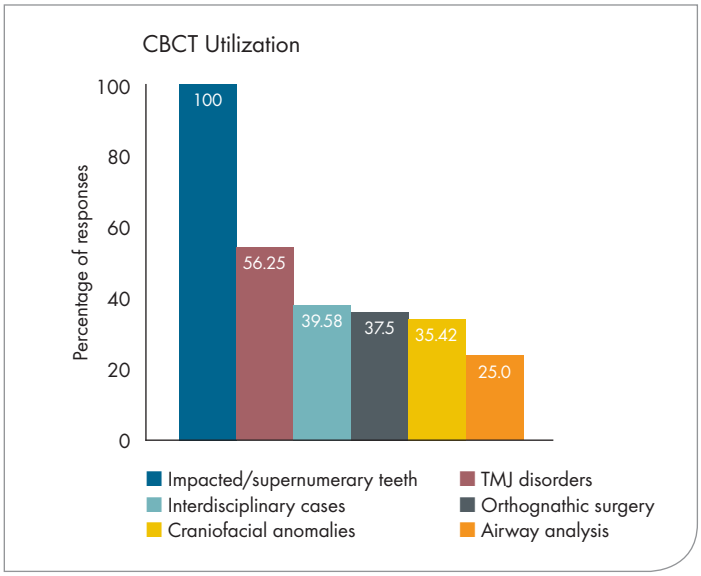

FIGURE 2. Specific clinical situations for which CBCT scans are used.

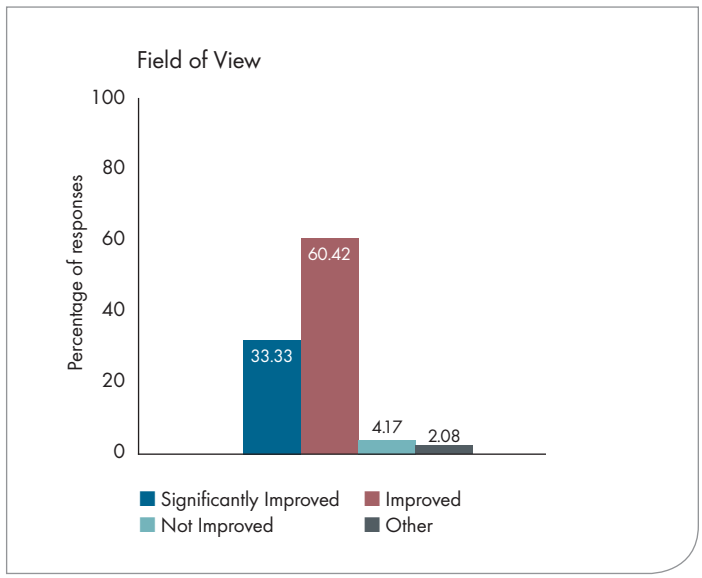

FIGURE 3. Impact that CBCT scans have had on the clinician's diagnostic ability.

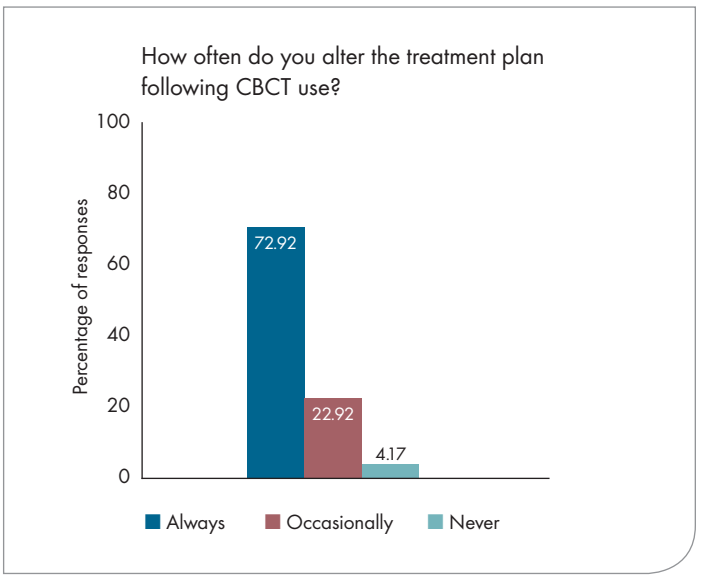

FIGURE 4. Impact the CBCT scans have had on ability to formulate a treatment plan.

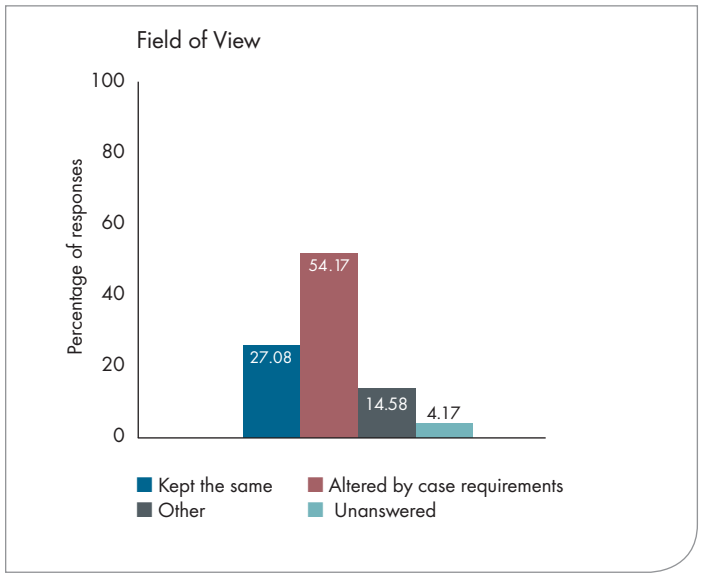

FIGURE 5. Use of variation in the field of view of CBCT scans.

Our respondents (56 percent) also reported using CBCT for evaluation of TMJ disorders. Barghan et al. reported that evaluation of TMJ using conventional radiographs is limited by structure and superimposition. CBCT allows examination of TMJ anatomy without superimposition and distortion to facilitate analysis of bone morphology, joint space and dynamic function in all three dimensions.[15] Honey et al. found that CBCT images were more reliable and accurate than linear tomography and panoramic radiography in detecting condylar cortical erosion.[16]

In our study, only 35 percent of respondents listed using CBCT for evaluating craniofacial anomalies. Smith et al. had significantly different results when they surveyed orthodontic residency programs about their use of CBCT scans for analyzing craniofacial anomalies. They reported that all of the respondents utilized CBCT scans for evaluating craniofacial anomalies.[12] Oberoi et al. demonstrated that volume-rendering using CBCT is a reproducible and practical method for assessing the preoperative alveolar cleft volume and the adequacy of bone fill postoperatively.[1-2]

In our survey, CBCT was used by 25 percent of the respondents for airway analysis. CBCT is currently being used to determine the linear, volumetric and cross-sectional area measurements of airways. Hatcher concluded that it is important for practitioners to incorporate 3-D imaging into their daily practices to evaluate and screen patients with airway related disorders.[17] Aboudara et al. found that when compared to lateral cephalometric head films, CBCT scans are simpler and more effective for evaluating nasopharyngeal airway size.[18] Three-dimensional imaging using CBCT is also reliable for accessing airway volume in cleft lip and palate individuals.[19]

The amount of radiation potentially absorbed by a patient during orthodontic imaging is of concern in today's society. In our study, the majority of CBCT users (66.7 percent) reported that their patients were concerned about increased radiographic exposure. Grunheid et al. reported that CBCT, besides providing additional diagnostic and therapeutic benefits, expose patients to higher levels of radiation than conventional digital radiography.[20] It has been demonstrated that a CBCT scan can expose a patient to five to seven times the amount of radiation of a panoramic radiograph[21, 22] or two to four times the levels of a full-mouth series of radiographs.[23] However, exposure with CBCT, especially if limited to maxillofacial areas, is rather modest and may be less than the combination of panogram, cephalogram and periapical films.[11] Lorenzoni et al. reported that an increase in field of view (FOV) of the CBCT results in a simultaneous increase in radiation dosage.[24] Thus, clinicians should vary the field of view of the CBCT scan depending on the needs of each patient. Of our respondents, 54.2 percent varied the field of view of the CBCT scan based on the particular case requirements. Silva et al. suggested that selection criteria for an image at any point during the treatment should follow the ALARA principle. Decision-making in oral radiology is thus a balance between risk assessment and the diagnostic information that can be obtained from 3-D CBCT scans.[25] The benefit/risk ratio should be greatly in the patient's favor.

It is important to clearly outline the guidelines for everyday use of CBCT imaging to minimize risks associated with ionizing radiation.

Interpretation of CBCT scans is complex, as the images contain far more detailed information of the maxillofacial region than do panoramic or other conventional 2-D radiographs.[26] In our study, responsibility for interpretation of CBCT scans was shared equally between the radiologist and the orthodontist. Smith et al. reported that in 59.1 percent of the programs they surveyed the radiologist was responsible for interpreting the CBCT volumes.[12] In 40.9 percent of the programs, the residents were primarily responsible for CBCT interpretation.[12] It has been suggested that orthodontists should be liable for interpretation of the entire CBCT image.[27] Thus, acquiring additional training for interpretation of CBCT scans is the responsibility of the orthodontist. As reported, 33.3 percent of the respondents listed that they received additional training for CBCT usage through the university. In addition, 31.3 percent of the respondents listed being self taught, while 27.1 percent listed continuing education courses as their primary source for additional training.

CBCT scans offer advantages for diagnosis and treatment planning in orthodontics. As a result, many practitioners have chosen to use CBCT. It is important to clearly outline the guidelines for everyday use of CBCT imaging to minimize risks associated with ionizing radiation. In May 2010, the House of Delegates of the American Association of Orthodontists adopted a resolution that states, "Resolved, that the AAO recognizes that while there may be clinical situations where a cone beam computed tomography (CBCT) radiograph may be of value, the use of such technology is not routinely required for orthodontic radiography."[28] Furthermore, in April 2010, Kokich

published an article in the *American Journal of Orthodontics and Dentofacial Orthopedics* that questioned the benefits of CBCT imaging on the outcome of treatment. He suggested that it is the responsibility of the clinician who orders the CBCT scan to deeply consider whether the benefit of the additional information gained from the scan outweighs the potential risk to the patient.[29] Concern for regular use of CBCT imaging is also evident among orthodontists located in the Pacific Coast region, as only 1 percent of the respondents reported using CBCT on all patients in their practices. The majority of the respondents (77.1 percent) used CBCT in less than 50 percent of cases and used it for the specific diagnosis of impacted/supernumerary teeth and TMJ analysis.

Conclusion

This survey demonstrates that CBCT is being used for diagnosis and treatment planning by orthodontists in the Pacific Coast region. A minority of these practitioners own a CBCT machine in their office. The use of CBCT has improved the orthodontist's ability to primarily diagnose cases that involve impacted/supernumerary teeth. The majority of the clinicians vary their treatment plans based on the additional information gained from the CBCT scans.

Concern for increased radiation from CBCT is present amongst clinicians and patients. The field of view of the CBCT scan should be varied based on the particular case requirements to keep radiation levels in accordance with the ALARA principle. In conclusion, the use of CBCT scans offers many clinical advantages to the practitioner. As cost of equipment and radiation levels from computed tomography decline, CBCT will be more widely used, as well as valued, for increased accuracy in the specific diagnosis of complex orthodontic treatment. ■

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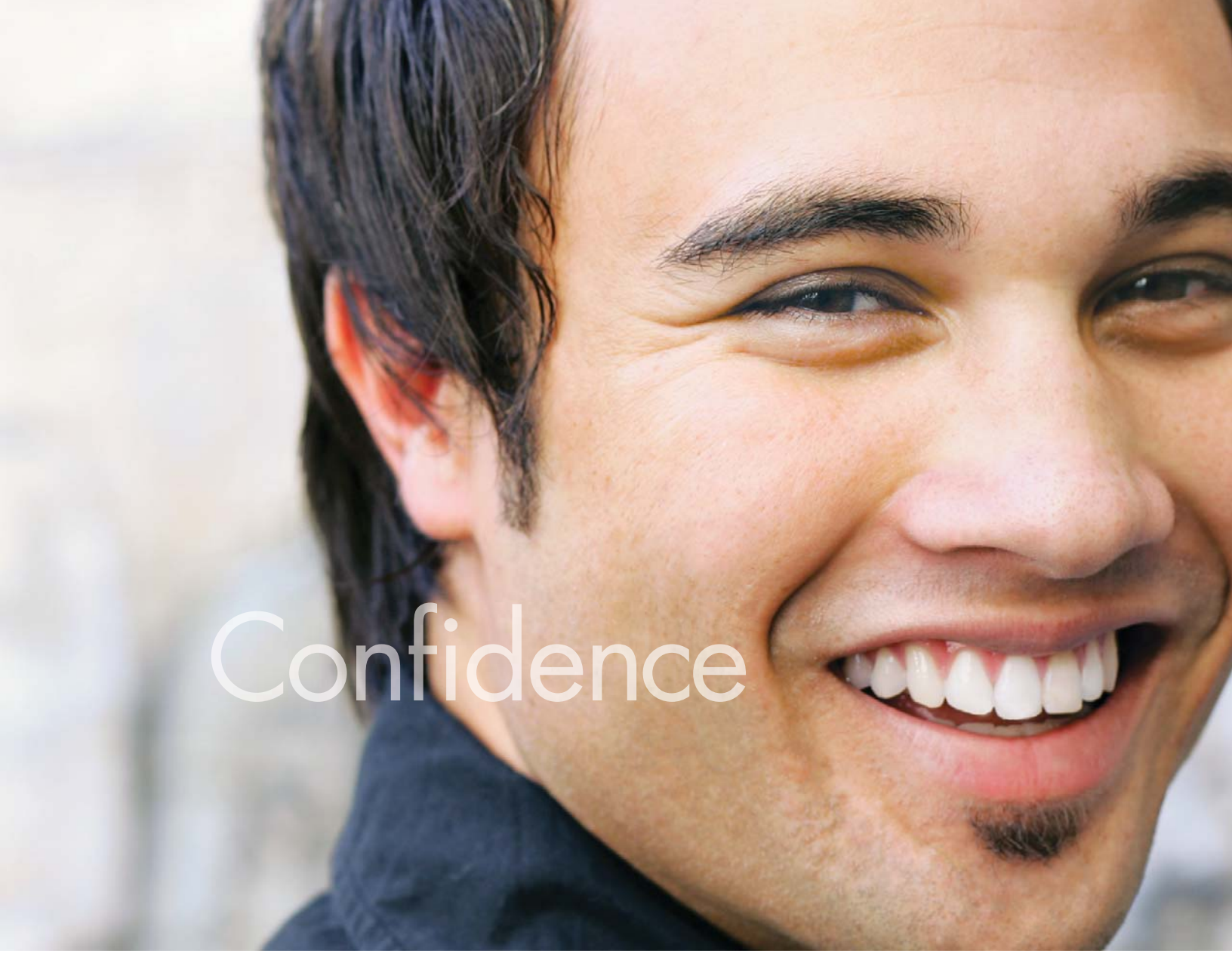

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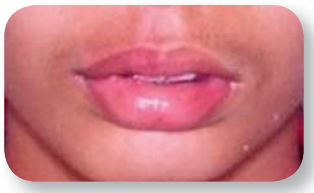

Midsymphyseal Distraction Osteogenesis With Lingual Tooth-supported Distractor: A Case Report

Anuradha Garg, BDS, MDS; Ashok Kumar Utreja, BDS, MDS; Satinder Pal Singh, BDS, MDS; Vidya Rattan, BDS, MDS; and Ashok Kumar Jena, BDS, MDS

ABSTRACT This report presents the treatment of a patient with severe mandibular anterior crowding caused by anterior transverse deficiency of the mandible. The treatment plan called for midsymphyseal distraction osteogenesis. A tooth-supported distractor placed on the lingual aspect of the mandible was used for mandibular widening.

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Conflict of Interest Disclosure: None reported.

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Conflict of Interest Disclosure: None reported.

Distraction osteogenesis (DO), initially reported in 1905 by Codivilla[1] was later popularized by Ilizarov[2,3] in the 1960s. Transverse skeletal deficiency is a common clinical problem generally associated with narrow basal and dentoalveolar bones. Mandibular symphyseal distraction osteogenesis (MSDO)[4-6] can be performed in cases with a V-shaped or anteriorly tapered mandible and severe mandibular crowding and unilateral or bilateral scissor bites. Guerrero pioneered the use of mandibular midline distraction, calling it "surgical rapid mandibular expansion."[7] In comparison to functional appliances that result in a change in the alveolar bone, distraction results in a change in the basal bone, thereby producing a change in the functional matrix. As a result, the expansion should have better long-term stability.

Although literature has described the use and effects of MSDO with different types of appliances, still only a limited number of practitioners have realized its potential benefits.[8-13] The following report presents the treatment of such a patient with MSDO using a custom-made tooth-borne expansion device placed onto the lingual aspect of the mandible.

Case Report

Diagnosis

A 13-year-old male presented at our orthodontic clinic with a chief complaint of crowding in the lower teeth (**FIGURES 1A–1K**). On extraoral examination, the patient had a leptoprosopic face, mild anteroposterior chin deficiency and convex profile with mildly protrusive competent lips. Intraoral evaluation revealed that the patient had a mesial step terminal plane bilaterally, 4 mm of

FIGURE 1A.

FIGURE 1B.

FIGURE 1C.

FIGURE 1D.

FIGURE 1E.

FIGURE 1F.

FIGURE 1G.

FIGURE 1H.

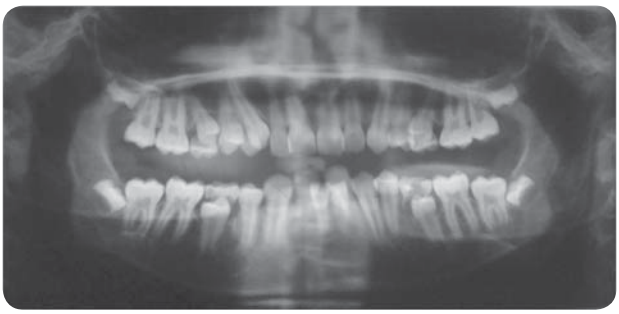

FIGURE 1I.

FIGURE 1J.

FIGURE 1K.

FIGURES 1A–1K. 13-year-old male patient with an anteriorly constricted mandible and crowding in the lower arch.

FIGURE 2A.

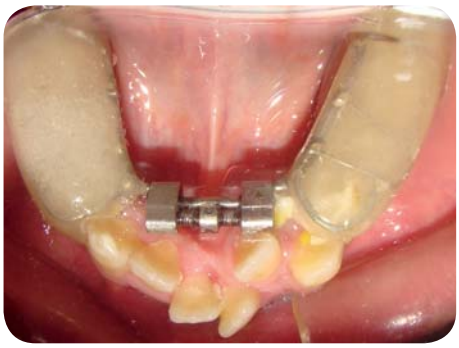

FIGURE 2B.

FIGURE 2C.

FIGURE 2D.

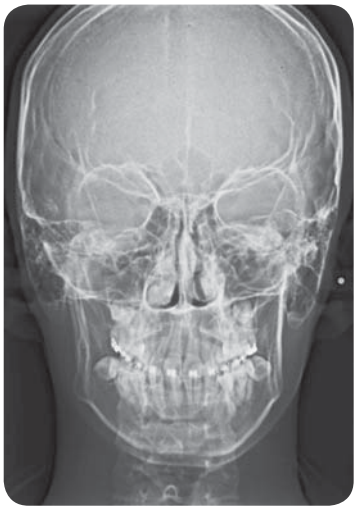

FIGURE 2E.

FIGURE 2F.

FIGURE 2G.

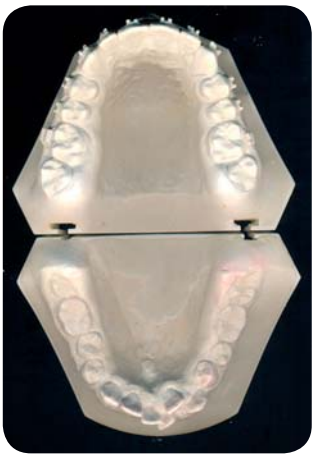

FIGURE 2H.

FIGURES 2A–2H. Midsymphyseal distractor appliance design; postdistraction changes after appliance removal.

overjet and 80 percent overbite. The dental cast analysis showed 3 mm of maxillary arch length deficiency and 10 mm of mandibular arch length deficiency localized in the anterior region. The mandibular arch was constricted from posterior to anterior as tapered arch form.

The panoramic radiograph revealed a complete permanent dentition with erupting all second premolars and developing third molars. Cephalometric analysis demonstrated a moderate skeletal Class II discrepancy with retruded mandible and a normodivergent skeletal pattern.

Treatment Plan

The treatment plan was to eliminate the dental crowding and establish a good occlusion. The first option available was the extraction of premolars, which could have led to further worsening of his profile. The second treatment option was the dentoalveolar expansion of mandibular dental arch by means of lip bumper or mandibular expanders. However, this treatment has a strong tendency to return to the pretreatment dimension because the symphysis ossifies at the age of one year.[14,15] The third treatment

FIGURE 3. Surgical procedure for midsympyseal distraction osteogenesis.

option was surgical advancement of the mandible for moderate skeletal Class II discrepancy. This, however, would not have addressed the anterior transverse deficiency and the patient refused this option. The treatment plan, therefore, included mandibular midline distraction osteogenesis along with comprehensive fixed orthodontic treatment.

Treatment Progress

The first portion of the treatment plan was presurgical orthodontics to level and align the upper arch and a lower lingual arch was cemented. This was followed by the construction of a custom-made tooth-borne mandibular-expansion appliance which consisted of a hyrax-type expander (Leone S.p.A, Florence, Italy) positioned on the lingual aspect of alveolar bone as close as possible to the floor of the mouth based on the patient's comfort level (**FIGURES 2A–2H**). The acrylic that covered the occlusal surfaces of mandibular molars was straight and smooth, with contacts to all maxillary posterior teeth. This was done using face-bow mounted models on a semiadjustable articulator. Root divergence of lower central incisors was assessed with the help of intraoral periapical and occlusal radiographs. In the second part of the treatment, the lingual arch was removed, and a bicortical midsymphyseal osteotomy between the central incisors was performed under local anesthesia (**FIGURE 3**). Immediately after surgery, the distractor was cemented and tested for expansion. After the latency period of seven days, the patient was instructed to activate the screw two times a day (two turns in the morning and two turns at night), producing 1 mm of expansion per day. After achieving a total of 8 mm expansion, the screw was sealed with acrylic and the device was kept in place for three months for consolidation. In the third part of treatment, leveling and alignment of the mandibular arch was performed. The maxillary right second molar was extracted to allow distalization of first molar for correction of molar relation. Finishing and detailing of the case was done and the mandibular arch was coordinated with the maxillary arch. The total treatment time was 21 months (**FIGURES 4A–4K**). A maxillary circumferential Hawley retainer and 3-3 lingual bonded retainer in the mandibular arch were prescribed. A 0.018" stainless steel wire segment was bonded onto the buccal aspect of the first and second molars in the fourth quadrant to prevent supraeruption of the mandibular second molar into the space distal to the maxillary first molar in the first quadrant.

Treatment Results

A functional Class I occlusion with good overbite and overjet was achieved and the patient's soft tissue profile was more balanced. The distraction phase itself had minimal effect on the clockwise rotation of the mandible and the sella-nasion/mandibular plane angle (SN-MP) decreased post treatment, resulting in an increase in the sella-nasion-B point (SNB) angle by the end of treatment (**TABLE 1**). It was observed that MSDO had less effect on the condylar and gonial areas than on the anterior part of the mandible (**TABLE 2**). Additionally, as measured on the dental casts, the predistraction and posttreatment intercanine and intermolar widths showed almost equal increase, thereby, indicating nearly parallel distraction of the skeletal and dental components (**TABLE 3**). The appearance of the newly formed bone at the midsymphyseal region was demonstrated. The upper and lower arch crowding was resolved. Records taken two years after debonding confirmed stability of the profile changes and the occlusion (**FIGURES 5A–5L** and **6A–C**). The patient was regularly monitored for development status of the maxillary right third molar, which during eruption drifted into the place of the extracted second molar.

Discussion

In this patient, MSDO with the use of an intraoral tooth-borne, lingually placed distraction appliance created additional mandibular arch length so that severe crowding could be treated with nonextraction orthodontics. A lingual arch cemented in the lower arch allowed some amount of E space to be used for correction of crowding. Symphyseal distraction provides the advantage of stability, gradual soft tissue and temporomandibular joint adaptation, less invasive outpatient surgery, the possibility of bigger movements and less likelihood of nerve injury.[1]

Devices for symphyseal widening have been broadly classified into intraoral and extraoral.[16] Intraoral devices are comparatively esthetic and are divided into tooth-borne, bone-borne and hybrid types. Bone-supported devices need a second surgery for removal of the distractor and are relatively expensive and invasive.[6] The transverse skeletal stability has been reported to be more with tooth-borne devices, although more expansion occurs at the alveolar than at the basal areas.[17] In correlation with our

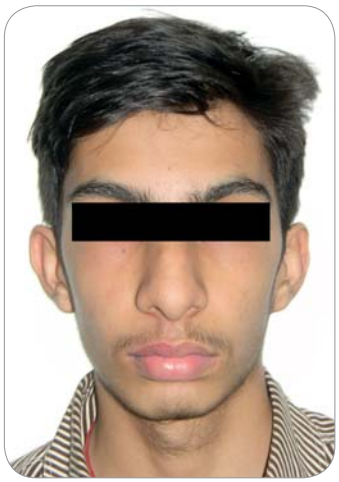

FIGURE 4A.

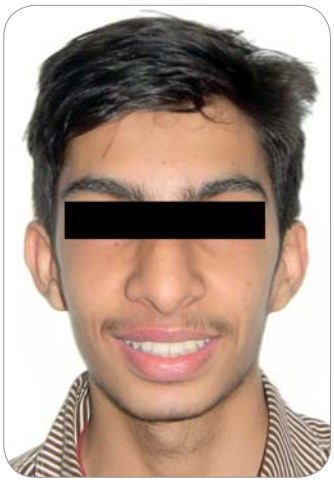

FIGURE 4B.

FIGURE 4C.

FIGURE 4D.

FIGURE 4E.

FIGURE 4F.

FIGURE 4G.

FIGURE 4H.

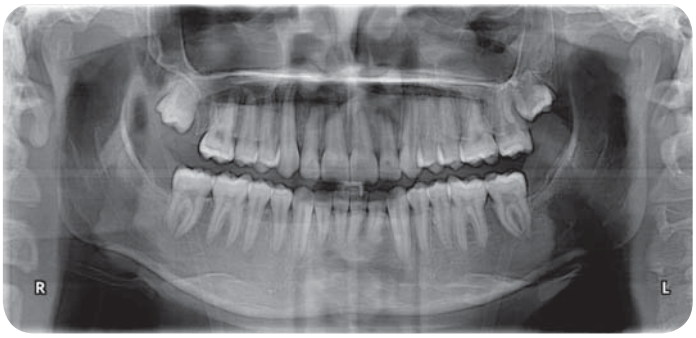

FIGURE 4I.

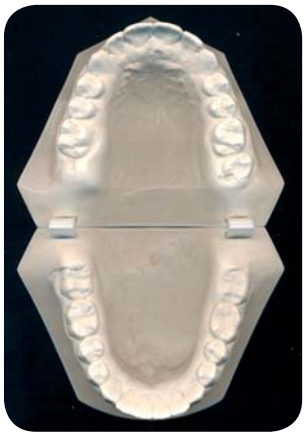

FIGURE 4J.

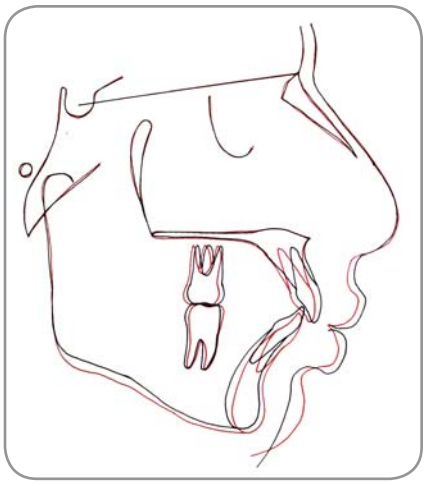

FIGURE 4K.

FIGURES 4A–4J. Patient after 21 months of orthodontic treatment; superimposition of pre- and posttreatment cephalometric tracings.

finding, Weil et al. has reported sagittal symmetry of the distraction gap with tooth-supported devices.[18] Theoretically, the distraction gap would have parallel margins if the force is applied near the center of resistance of the mandible. For a bone-borne distractor, it has been claimed that parallel expansion of the mandible occurs if it is placed on the mandibular anterior surface slightly above the apex of the mandibular incisors.[19] This was similar to our site of placement of the distraction device.

Our approach allowed the mandibular incisors to drift and align spontaneously during the distraction and consolidation periods, distributing the soft tissue tension between all anterior teeth. The rate of tooth movement has been reported to be faster when teeth are moved into immature bone.[20] Liou et al. demonstrated that a tooth could be moved into the regenerated bone early in the consolidation period.[21] This was in correlation to our finding, as this patient was found to have healthy and periodontally sound mandibular incisors. However, some studies have shown root resorption and periodontal defects when teeth are allowed to move into the newly forming bone.[7,22]

MSDO is similar to surgically assisted rapid maxillary expansion (SARME) except that no lateral surgical dysjunction is done because the mandible has no rigid connection to the skull. A distraction of the mandible, thus, will not be parallel, but will always rotate around the condyles. According to Samchukov et al., each condyle rotates approximately 3° for every 10 mm of expansion.[23] This patient had no signs or symptoms of temporomandibular disorder. The temporomandibular joint probably adapts to the minor alterations that take place.

Better long-term stability has been reported with SARME than orthopedic, functional or orthodontic expansion in adult patients. The same should also hold true for symphyseal distraction, though there is a need for further long-term stability studies.

TABLE 1

Cephalometric Data

Cephalometric variable	Pretreatment	Postdistraction	Posttreatment
SNA (°)	81	81	80.5
SNB (°)	75	75	76.5
ANB (°)	6	6	4
SN/GoGn	31	33	29
U1/SN (°)	100.5	99.5	103
IMPA (°)	108.5	107	105
UL-E (mm)	3.5	0.5	0.5
LL-E (mm)	5.5	2	1

TABLE 2

Changes in Widths as Measured on Posteroanterior Radiographs

Width (mm)	Pretreatment	Postdistraction	Posttreatment
Bicondylar	98.5	98	98
Bigonion	96.5	98.5	98
Mandibular intermolar	65	68.5	68
Mandibular intercanine	24.5	26	28

TABLE 3

Dental Cast Measurements

Width (mm)	Pretreatment	Postdistraction	Posttreatment
Mandibular			
33–43	21	28	28.5
36–46	42	47	47
Maxillary			
33–43	32	35.5	36
36–46	49	48	49.5

Conclusion

MSDO with a lingually positioned, tooth-supported distractor can produce an equal amount of expansion in the anterior and posterior parts of the mandible. It is a good noninvasive and inexpensive treatment option for patients with an anteriorly tapered mandible where other treatment alternatives can compromise stability and worsen the esthetics. ■

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FIGURE 5A.

FIGURE 5B.

FIGURE 5 C.

FIGURE 5D.

FIGURE 5E.

FIGURE 5F.

FIGURE 5G.

FIGURE 5H.

FIGURE 5I.

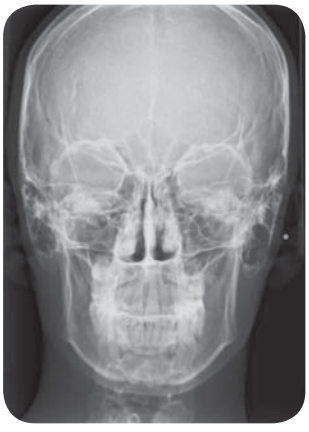

FIGURE 5J.

FIGURE 5K.

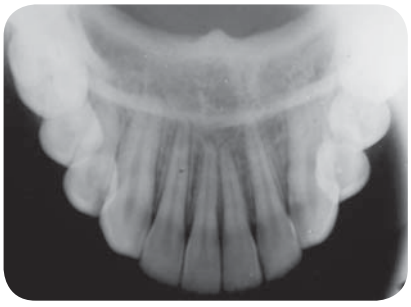

FIGURE 5L.

FIGURES 5A–5H. Patient after 21 months of orthodontic treatment; superimposition of pre- and posttreatment cephalometric tracings.

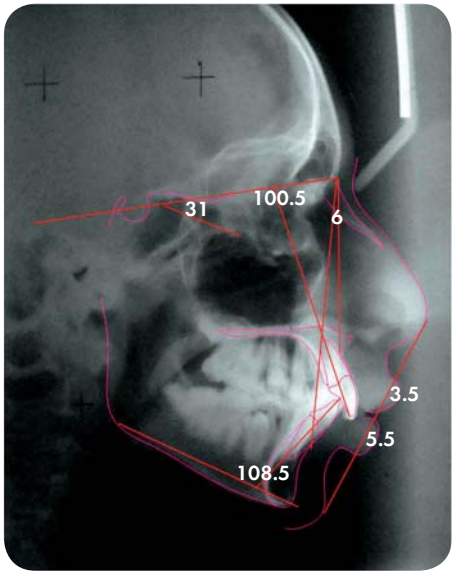

FIGURE 6A. Pretreatment.

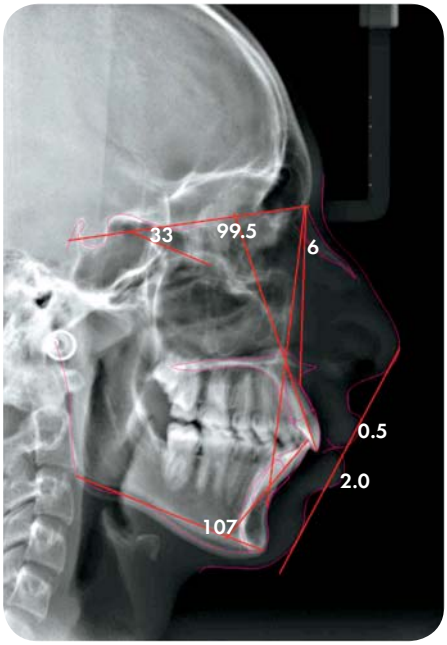

FIGURE 6B. Posttreatment.

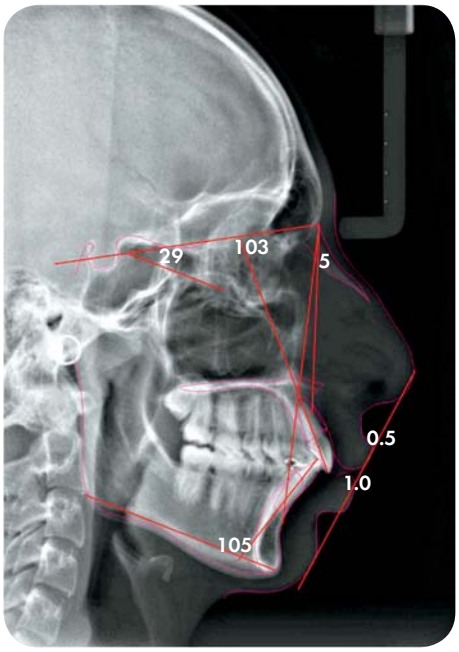

FIGURE 6C. Two-year follow-up.

FIGURES 6A–6C. Comparison of pretreatment, posttreatment and two-year follow-up tracings superimposed on cephalograms.

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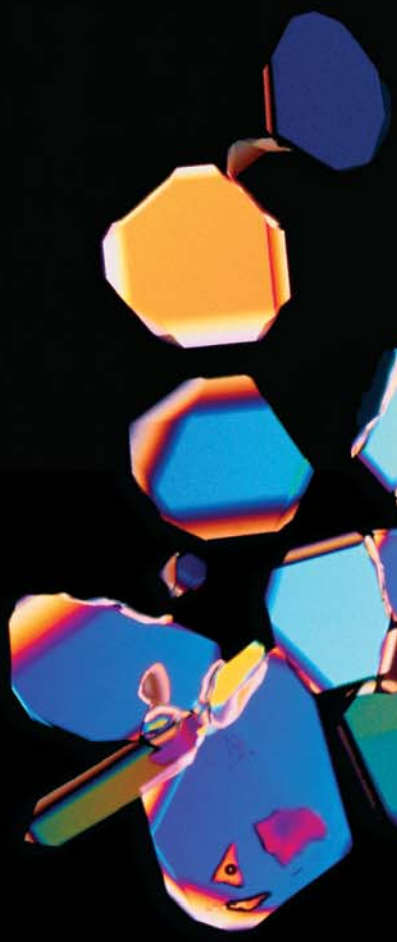
Pascal Magne,
DMD, PhD



This year, catch a few rock stars.

The biggest names in restorative dentistry are gracing the stage at this year's *CDA Presents*. There's world-renowned esthetic dentist and "father" of Biomimetic Dentistry, Pascal Magne, DMD, PhD. He shares the stage with Gerard J. Chiche, DDS, the Thomas P. Hinman Endowed Chair in Restorative Dentistry, as well as Lee Ann Brady, DMD, named one of the Top 25 Women Dentists in the U.S. What's more, there are rock-star presenters in every arena from practice management to online marketing. *CDA Presents.* So much more than you imagined.

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CDA JOURNAL, VOL 42, N°3

Leadership in Private Dental Practice

Michael Perry, DDS

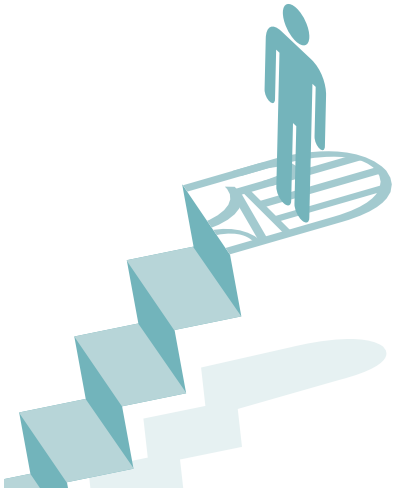
Dentists tend to be analytical, compassionate, introverted and linear thinking. These characteristics form a skill set commensurate with being an effective doctor and microsurgeon, but not necessarily the leader of a dental practice in today's marketplace. Consequently, many dentists find leadership to be a challenge.

My father practiced pediatric dentistry for 44 years. My clinical career overlapped his for about 15 years. Observing my dad, his colleagues, my clients and in my own practice experience, I have seen what I define as three basic styles of private practice leadership: the authoritarian model, the family model and the facilitation model.

I've met few dentists who declare or are even aware of these leadership categories. Most seem to adopt one style by default.

During the 60s and 70s, most dentists were men and were typically the unquestioned authority in their practices. They often gave orders concerning every detail of practice operation and employees usually complied. A diminishing percentage of dentists still use this model.

In the 80s and 90s, a greater variety of private practice types evolved, including those with tiered management — which often separated the dentist from a significant portion of business decisions. This evolution, dentists' fundamental characteristics and their lack of management and leadership training, in my view, created the family model that commonly exists today. In the family model, leadership is often performed via consensus, and relationship dynamics within the practice are usually a significant force in decision making. Some dentists have made the family model work to create their version of success. In general, however, I do not see this model as effective in today's marketplace.



Max DePree, in his seminal book *Leadership Is an Art*, states, "Everyone has the right and the duty to influence decision-making and to understand the results. Participative management guarantees that decisions will not be arbitrary, secret or closed to questioning. Participative management is not democratic. Having a say differs from having a vote." This statement catches the essence of leadership by facilitation — the optimum style, in my opinion, for today's private practice.

Leadership by facilitation is the art of moving an organization toward a declared purpose. In a dental practice, it is the responsibility of the owner/dentist to define and declare his/her purposes for being in practice. A purpose could be the overall mission of the practice or a more specific one, such as the level of service and profitability in the hygiene department. Employees are respected and receive a say in defining a purpose, but they do not receive a vote.

Once a purpose is defined, the dentist engages in a participative process with employees that leads the practice toward that purpose. This "facilitation" revolves around the question, "How can we move as effectively, efficiently and enjoyably as possible from where we are now toward the purpose I've defined?" The answer to this question always creates an action plan. Employees continually participate in answering this question and are then responsible for playing their respective roles in implementing the action plan.

Some dentists would like to change the way they lead their practices, but feel trapped in their current circumstances with their employees. Changing a practice that utilizes a family-style leadership to one utilizing leadership by facilitation can be a challenge, but is well worth the resources and effort to achieve it. In my own experience, making that transition and running my practice via facilitation has been one of the most freeing and effective experiences of my professional life. ■

Michael Perry, DDS, is a former member of the California Dental Association Council on Membership and the Dental Benefits Research Task Force. He is also the chair of the CDA Practice Support Center Task Force. Dr. Perry is a practicing general dentist in Santa Rosa,Calif., and a dental business consultant.

CDA JOURNAL, VOL 42, N°3

Oral Cancer Protocol Essential as Legal Cases Rise

TDIC Risk Management Staff

The Dentists Insurance Company reports an increase in claims related to oral cancer and advises dentists to conduct regular oral cancer screenings on all patients. In addition to consistent documentation of screenings, follow-up and referral of any suspicious lesion or area is strongly recommended.

"If dentists do not follow up on something they see in a patient's mouth that looks suspicious, they risk missing an oral cancer diagnosis and early treatment," said Gary V. Gittleman, a Philadelphia-based attorney who has specialized in defending dentists for more than 40 years. Gittleman said he has seen a spike in lawsuits related to oral cancer, a trend that began around 2010.

"If dentists do not follow up on something they see in a patient's mouth that looks suspicious, they risk missing an oral cancer diagnosis and early treatment."

"What we are seeing is that some practitioners are just not keeping up with conducting screenings," he said. "Also, oral cancer was typically thought of as a disease associated with older male patients who smoke and drink, but younger people can be at risk, too."

Gittleman emphasized that a comprehensive oral exam must include an oral cancer screening that begins with the lips and includes the gums, floor of the mouth, tongue and hard and soft palate. Documentation of oral cancer screenings is equally important. "It has to be noted in the patient's chart that the screening was negative or within normal limits," he said.

If dentists find any lesion or spot that looks unusual, Gittleman advises photographing the area if an intraoral camera is not used. Cellphone photos are acceptable. If a camera is not available, make a drawing of the lesion. Add the photo or drawing to the patient's chart and be as descriptive as possible about the width, height, shape and color of the lesion, including any subjective complaints from the patient, such as swelling or pain.

"I suggest that all dental practitioners use a SOAP note (subjective, objective, assessment and plan) for each visit," Gittleman added.

"My rule is that if you see a lesion, you must get the patient back in your office in two weeks," Gittleman said. "The problem is that some patients will not follow up, so every office must have a 'tickler' system where two letters are sent, one certified and one regular mail, advising

CONTINUES ON 193

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ANAHEIM: General Dentistry Practice. 3 Ops. Nicely appointed and modern. GR $423K w/ Adj Net of $140K. Seller refers out specialty procedures and is retiring. Growth potential! #CA101

BAKERSFIELD: General Dentistry Practice. 3,650 sq. ft. 8 Ops, 7 equipped. Digital x-rays and intraoral camera. GR $1.2MM w/Adj Net of $453K. Growing area. #CAM554

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

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

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

CERRITOS: General Dentistry Practice. 1,500 sq. ft. 7 Ops, 6 equipped, 1 plumbed. Digital x-rays, SoftDent. Near shopping, residential, and freeway. GR $408K w/Adj. Net of $140K. Established 39 years. Room to grow. #CA100 – In Escrow

CHULA VISTA: General Dentistry Practice. 4 Ops, 3½ days of hygiene, Dentrix software. 2012 GR $528K. #CA109.

CLAREMONT: General Dentistry Practice. 6 Ops. 8 days of hygiene/week. GR $581K w/Adj. Net of $147K. #CA114

COALINGA: General Dentistry Practice. 1,100 sq. ft. 3 Ops. Remodeled in 2011. 1,000 active patients. Excellent opportunity for new dentist or established dentist looking for satellite office. #CA564

COASTAL ORANGE COUNTY: General Dentistry/Implant Practice. 1,800 sq. ft. 4 Ops. Implants done in all Ops. 2012 GR $1.1MM. #CA520 SOLD

COASTAL ORANGE COUNTY: General Dentistry Practice. Retiring doctor spent $500K on 4 new Ops - high-end chairs, cabinetry, and tenant improvements. Dentrix, and Dexis, Digital Pan. Close to the ocean – dream location! 2011 GR $600K+, 2012 GR $500K+. #CAM566

COASTAL ORANGE COUNTY: Periodontal Practice. 5 Ops, Retiring doctor works 3 days/wk with 4 days of hygiene. 2012 GR $450K+. Great location near freeway/hospital. #CAM533

DANVILLE: FACILITY ONLY. 5 Fully equipped Ops. Digital Pano, and central [illegible]/Oxygen. Seller relocating. #CA548 SOLD

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

FREMONT: 3,000+ sq. ft. 10 Ops. Digital X-rays and Pan. 4,000 active patients. PPO/HMO w/2012 GR $1.2MM w/ Adj. Net of $300K. #CA553 – In Escrow

GRANITE BAY: General Dentistry Practice. Newly remodeled office, 5 Ops, 3 equipped. Dentrix, Digital X-rays, 2013 GR $236K+ on 8 days/month. Owner relocating out of country. #CA128

GRASS VALLEY: General Dentistry Practice. 1,[illegible] Ops, 4 equipped. GR $491K w/Adj. Net of $130K. #14379. SOLD

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

GREATER SACRAMENTO/ ROSEVILLE: Partnership position in General Dentistry group practice. Each partner has own patients. Intra-Oral, Digital X-Rays (Dexis), Digital Pan. Excellent Mgmt team. Owner financing w/acceptable down payment. Subject to approval by current partners. #CA126

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

HENDERSON, NV: DECEASED DENTIST: Pediatric Practice. 6 Ops. Dentrix, and Pan. GR $875K, 2012 GR $766K, 2013 GR $988K (first 9 months). Available for immediate sale. #NV100 SOLD

HOLLISTER: FACILITY ONLY: 1,800 sq. ft. 3 Ops w/ 2 additional plumbed w/ cabinets. Adec chairs, units, and lights, Dexis, Easy Dental, and Pano X-ray. Owner relocating to own building. #CA563

HUNTINGTON PARK: Retiring General Dentist with a large group practice that was started in 1984. 15 Ops. Dentrix/Dexis w/ 25 computer workstations. E4D CAD/CAM machine. GR 2012 $1.1MM+. Seller owns the building. #CA113

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

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

LA MESA: 2,000 sq. ft. 3 Ops. Professional building. 2012 GR $396K w/Adj Net of $155K. Practice utilizes Dentrix, Laser, and Digital X-Rays. #CA127

MILPITAS: General Dentistry. 1,440 sq. ft., Professionally designed office in major business district. 4 Ops. Intraoral cameras and computers. Pano X-ray. Owner retiring. #CA562

MURRIETA: General Dentistry. 5 Ops. 2012 GR $1[illegible] Net of $875K. 8 days of hygiene/week. #CA107 SOLD

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

NORTH EAST BAY: General Dentistry Practice est. over 35 years. Owner retiring. 7 Ops. 2,324 sq. ft. with Dental Mate software, Intraoral Camera, Pano X-ray, and Digital X-ray. 2012 GR $885K w/overhead of under 70%. Building to be sold with practice. #CA108

NORTH OF SACRAMENTO: General Dentistry. Newly remodeled office. 4 equipped Ops, 5 available. Approx. 1,500 active patients. 2012 GR $515K on 32 hr/wk. and 37 wks/yr. EZ Dental, Pan., Fiber Optics. 20 hrs. hyg./wk. Bldg. available for purchase. # CA558

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

NORTH OF SACRAMENTO: General Dentistry. 5 Ops. 2,050 sq. ft. 2012 GR $1.2M+ w/ overhead of only 54%. Dentrix, Intraoral Cameras, Digital X-ray, Imaging System, and Pano. Practice established at current location for over 15 years. #CA106

NORTH ORANGE COUNTY: Endodontic Practice with 5 Ops, fully equipped and 3 Zeiss wall-mounted microscopes. Estab. 30 yrs. Gross Coll. $370K and Adj. Net Inc. of $172K on 3 day wk. #CAM561

NORTH SAN DIEGO COUNTY: Large legacy practice. 12 equipped Ops. HMO practice with large CAP check in a desirable area in North County. #CAM543. – In Escrow

ORANGE COUNTY: General Dentistry Practice with 2012 GR of over $1.1MM and $515K of Adj. Net. Located in a retail center in a desirable area in Orange County. #CA132

RIDGECREST: General Dentistry Practice and Dental Building. 1,500+ sq. ft. office building with 4 Ops. Small practice grossed about $175K in '12. #CA523

RIVERSIDE – General Dentistry Practice with emphasis on Implants and Building. 5 Ops, established over 50 years. 2012 Gross Coll of over $500K. #CA120

S. ORANGE COUNTY – General Dentistry. General Dentistry Practice with 4 Ops in a 1,350 sq. ft. suite in a coastal location. Practice utilizes Dentrix. #CA119

SACRAMENTO: General Dentistry. 2,400 sq. ft. office/building with low 54% overhead. 8 Ops, 7 equipped. 2012 GR $642K. #CA549

SAN CLEMENTE: General Dentistry Practice. 3 Ops equipped, 2 additional plumbed. Established 10 years. Uses PracticeWorks. Digital x-rays, Pano. #CA129

SAN JOSE: FACILITY ONLY: 3,700 sq. ft. 6 Ops. Digital X-ray, sterilization, computer workstations in every room. Reception w/flat screen TV, equipped business office, and conference room. #CA565

SANTA CRUZ: Endodontic Practice. 850 sq. ft. 2 Ops w/ Schick Digital X-rays, ideal for a satellite practice. Owner will work for new buyer 1-1½ days/wk. GR $350-$400K. 55% overhead. #CA102 – In Escrow

SANTA CRUZ COUNTY: General Dentistry. 1,100 sq. ft. 3 Ops. Professional bldg near Hwy 1. GR $338K on 2 day/wk. 2,200 active patients. 10 new patients/month. Schick Digital X-ray and Dentrix software. Equipment 5 yrs. Old. Moving. #CA550

THOUSAND OAKS: Retiring General Dentist has been practicing for 37 years. Office collected $616K in 2010, $621K in 2011 and $589K in 2012. 6 Ops and 8 days of hyg/wk. Dentrix /Dexis. #CA118

TURLOCK: General Dentistry. 2012 GR $950K+ w/ Adj. Net of $443K. #CA506 – In Escrow

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

WALNUT CREEK: Prosthodontic Practice. 3 fully-equipped Ops. Full lab. 2012 GR $530K. #CAM540

WEST LOS ANGELES: General Dentistry Practice. 4 equipped Ops, 1 plumbed, not equipped. Great LA location on the west side. GR $342K on just 2 doctor days/week. Room to grow! #CA117

YORBA LINDA: General Dentistry Practice. 5 Ops in great location. Laser, Intraoral camera, and digital X-rays. 3 hygiene and 3 doctor days/wk. #CAM531

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CONTINUED FROM 190

the patient that follow-up is imperative. Inform patients that they must return to your office or see an oral and maxillofacial surgeon to have the lesion checked."

He added that dentists need a system for documenting communication with patients who neglect to follow up with appointments, especially if there is a risk of oral cancer.

A patient must be referred to an oral and maxillofacial surgeon if a lesion looks abnormal or changes in appearance over a two-week period. "This is best for the patient and the doctor," Gittleman said. An oral surgeon will perform a biopsy, and an oral pathologist will make the call. "It is only under the microscope that the nature of the cells can be determined." ■

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BC-175 EAST CONTRA COSTA: Vast employment, shopping & activities! 1,995 sf w/5ops **$300k**

BC-221 EAST CONTRA COSTA: Well Respected w/ loyal patients, Seller is retiring! 1900 sf w/ 4 ops **$325k**

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

BG-226 ANTIOCH (Real Estate): OWN your dental facility! Priced to move quickly at less than $100/ft. ~ 1,500 sf w/ up to 5 ops **$137k**

BN-233 ALAMEDA: If real estate and space are what you've been looking for, here's your practice! ~ 3,139 sf w/ 8 ops. **$275k, RE: $825k**

CC-151 SANTA ROSA: Stable patient base, well-respected, close to Memorial Hospital. 2,262 sf w/ 6 ops **$875k** *Real Estate avail.*

CC-170 SOLANO COUNTY: Near Wine Country! 950 sf w/3 ops **$225k**

CN-189 RIO VISTA: In the heart of the beautiful California Delta! 3 ops **$275k**

DC-250 MILPITAS: Seller retiring! 1300 sf w/ 3 ops+1 plumbed. Owner-occupied Suite. 2-story Med/Dent. Bldg. **$400k (Real Estate also available)**

DG-116 SALINAS AREA: Large, loyal & stable patient base! Popular Retail Center. 1,400 sf w/5 ops. State-of-the-art Equipment **$195k**

DG-124 MILPITAS: Highly visible. Desirable area. 960 sf w/ 2 ops + 1 add'l **$130k**

DG-156 SAN JOSE: Hardwood Floors & plenty of windows! 1,160 sf w/ 3 ops (+2 add'l) **REDUCED! $125k**

DG-222 SAN JOSE: High traffic Retail Shopping Center with unbeatable signage. 2,847 sf w/ 7 ops **$925k**

DG-223 SUNNYVALE: **Seller Relocating!** Popular Retail Shopping Plaza with major anchor tenants. 2,000 sf w/ 6 ops +1 **$450k**

DG-212 FREMONT: Courtyard Garden welcomes patients. Your talent and skill keeps them! 2,181 sf w/ 3 ops **$175k**

BAY AREA CONTINUED

DG-232 SANTA CRUZ: Large, well-established Medical/Dental Prof complex! 1,063 sf w/ 3 ops **$345k**

DG-224 SANTA CRUZ: Fully computerized & digitally upgraded. Exudes serenity w/ relaxed beach theme, enclosed courtyard. 904 sf w/3 ops **$375k**

DG-239 PALO ALTO: Amazing Location! Pristine practice. "Top-of-the-line" Pelton Crane . 2000 sf w/5 + 1 add'l **$1.05m**

NORTHERN CALIFORNIA

EG-198 SACRAMENTO: Tucked in well established "Pocket Area" in highly desirable corridor. 1,112 sf w/3 ops **$125k**

EG-237 ROCKLIN: State-of-the-art, top-of-the-line equipment. 1,000 sf w/ 2 ops. Plumbed for 2 add'l **$245k**

FN-181 NORTH COAST: Well respected FFS GP. Stable patient base. 1,000 sf w/3 ops **SELLER MOTIVATED! $150k (25% int. in bldg. avail.)**

FN-185 UKIAH: 900 sf w/ 3 ops. Seller Willing to Negotiate! **$250k**

GN-196 CHICO: Appealing location! ~2,510 sf w/4 ops **$150k**

GN-149 YREKA: Quality FFS, Warm & Caring. 900 sf w/ 3 ops. Now Only:**$180k/Real Estate $110k**

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

GN-228 CHICO/PARADISE AREA: A reputation built on quality care and personalized service in a warm and caring atmosphere. Office ~ 898 sf w/ 3 ops. **$250k**

GN-244 OROVILLE: Must See! Gorgeous, spacious 2500 sf office w/5 ops! Collections over $450k in 2013. **Only $315k**

HN-213 NORTH EAST CA: Close to the Oregon Border, this FFS practice is ~2,200 sf w/ 3op +1 **add'l $145k**

HN-197 EAST LODI FOOTHILLS: Two practices for one great price**!** Call today for details! **$595k**

HN-242 YOSEMITE (Charts Only): Increase your Patient Data Base with this incredible opportunity to procure 500+ charts ! **$75k**

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IG-067 STOCKTON: Fully computerized, paperless, digitalized. 5,000 sf w/10 ops **Now $425k**

IG-165 TURLOCK: Well established Shared/Solo Group Practice. 10 ops (shared) **$428k**

IN-193 Modesto Facility: Recently remodeled! High foot traffic! Can be purchased with or without new equipment. 2,300 sf w/6 ops (4 fully equipped) **$169k**

IN-205 STOCKTON Facility: Desirable professional corridor. Newly remodeled. 1,565 sf w/ 4 ops **$169k**

JG-188 FRESNO: Loved, respected, Established! Net Profit over $350k! 1,452 sf w/4 ops **$390k**

JN-219 TULARE: Imagine working here in this highly esteemed **fee-for-service** practice! Office is ~ 1,500 sf w/ 4 ops. **$425k**

IN-211 MODESTO: Located in a single story, multi-unit Professional building, 1,500 sf w/ 4 ops. **$300k**

SPECIALTY PRACTICES

DC-246 PLEASANTON Pediatric: Highly Motivated Seller selling this beautiful Pediatric Practice or Facility Only. Office is ~1700 sf w/ 4 ops & plumbed for additional ops. **Practice $325k or Facility only $250k**

EG-131 ROSEVILLE Ortho: Reputation, loyal patient base, seasoned staff & beautiful, spacious facilities. 1,100 sf w/ 4 chairs **$95k**

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

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

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

GN-209 SACRAMENTO VALLEY Endo: Be the one to carry on the stellar reputation and tradition! 1,400 sf w/ 3 ops **$350k**

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

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

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

ASK THE BROKER

How do you determine the listing price of my practice?

The single-most important factor in determining the practice sales price is the collection total of the previous calendar year. Lenders and Buyers like to see stability without large variances from year to year. It should be obvious that steady, slight increases in revenues are always better than even the slightest of decreases. Poor performance of one of three years *should not* affect pricing, unless it is the last calendar year that shows a significant drop. Therefore, try to maintain a stable practice, make sure you finish strong and make all your December deposits for that last year you will be filing!

Practices are priced based heavily on gross receipts. Let's work through some scenarios and options. If you plan to practice 2-3 more years, it is not worth investing extra money in the practice. In this case, I would just advise finishing strong, especially to reflect your last tax return which will be filed. If you plan to practice approximately 5 years, spending large amounts of money for new technology may not necessarily return the investment unless it helps to increase your production. However, this being said, purchasing new equipment may increase your enjoyment of practicing dentistry and therefore be a worthwhile investment.

With 8–10 years remaining to practice, modernizing the practice with the latest and greatest is generally a great idea. Leasehold improvements typically last 5-8 years, so making the investment at this time to spruce up the office will enhance the desirability of the sale. It may also give you greater satisfaction of working in a first-rate environment for the entire duration of the leasehold improvements.

Here's an interesting demographic to consider: Ten years ago, the JADA published an article concerning the baby boomers' retirement, which may affect those in the 4-7 year timeframe. Most of us in the industry believe that the "baby boomer" phenomenon coupled with the current sellers' delayed frame-of-mind might result in a significant inventory glut. This may slightly reduce practice price multiples when and if it happens all at once.

This phenomenon will favor practices that have updated their technology to induce the younger buyers. Most graduates in the past 5 years don't know what an X-ray developer is. Therefore, those of you planning to retire in the next 4-10 years should consider making the investment now to position yourself ahead of the competition when the glut of practices comes about.

Most importantly, since practice values are based on gross receipts, keep up the good work!

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

Dental Assisting Training Requirements

CDA Practice Support

The unlicensed dental assistant is the entry-level position of the dental profession. With additional education and training, an unlicensed dental assistant may obtain a specialty permit in orthodontics or surgery, as well as become a registered dental assistant.

Who in the practice qualifies as a dental assistant?

A dental assistant is an individual who is assigned to perform the duties listed in Business & Professions Code Section 1750 and 1750.1. General supervision duties, for example, include:

- Performance of extraoral duties or procedures specified by the supervising licensed dentist, provided that these duties or procedures meet the definition of a basic supportive procedure. "Basic supportive procedures" are those procedures that have technically elementary characteristics, are completely reversible and are unlikely to precipitate potentially hazardous conditions for the patient being treated. Instrument sterilization and other infection control duties are considered basic supportive procedures. The supervising licensed dentist is responsible for determining the competency of the dental assistant to perform basic supportive dental procedures.
- Operation of dental radiography equipment for the purpose of oral radiography if the dental assistant has completed a California Dental Board-approved radiation safety course or passed a radiation safety exam.
- Perform intraoral and extraoral photography.

Even if an individual's work is primarily in the front office, the individual is considered a dental assistant upon the performance of duties in the clinical area.

What are the training requirements for a dental assistant?

The employer of a dental assistant is responsible for ensuring that the dental assistant who has been in continuous employment for 120 days or more, has already successfully completed, or successfully completes, all of the following within a year of the date of employment:

1. A board-approved course in the Dental Practice Act.
2. A board-approved eight-hour course in infection control.
3. A course in basic life support offered by an instructor approved by the American Red Cross or the American Heart Association, or any other course approved by the board as equivalent and that provides the student the opportunity to engage in hands-on simulated clinical scenarios.

The employer must ensure the dental assistant maintains certification in basic life support.

What are the requirements for obtaining a specialty permit?

In addition to successful completion of the above courses, the dental assistant must complete at least 12 months of work experience, a board-approved specialty assistant course in orthodontics or surgery and a board-administered examination.

To renew the specialty permit, a dental assistant must complete the same continuing education and license renewal requirements as are required for a registered dental assistant.

How does an individual become a registered dental assistant?

The individual must either:

1. Graduate from a registered dental assisting education program approved by the board and perform satisfactorily on a written and practical examination administered by the board; or
2. Provide evidence of completing satisfactory work experience of at least 15 months as a dental assistant in California or another state and perform satisfactorily on a written and practical examination administered by the board.

The individual must provide documentation of successful completion, within five years prior to application, of a course in the Dental Practice Act, a board-approved eight-hour infection control course and a basic life support course approved by the American Red Cross or the American Heart Association. Evidence of successful completion of board-approved courses in radiation safety and in coronal polishing also is required.

Finally, the successful applicant for RDA licensure must demonstrate satisfactory performance on a written examination in law and ethics administered by the board.

Additional information on allowable duties, licensing requirements, license renewal requirements and registered dental assisting in extended functions is available.

- For more on dental assisting categories, visit cda.org/LinkClick.aspx?fileticket=iAkuU4oGM4k%3d&portalid=0
- For information from the Dental Board of California, visit dbc.ca.gov/da_program/index.shtml ■

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

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3088 SAN JOSE GP & BUILDING

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

PENDING

3092 SF FACILITY

1,600 sq. ft. street-level dental facility in Marina/ Cow Hollow neighborhood across from Presidio with excellent visibility and signage for foot traffic plus easy diagonal parking in front of building. Move in ready with 4 ops., 2 labs, kitchenette, reception and 2 desk areas plus 2 pvt. offices, 2 bathrooms, 1/2 basement & backyard with deck. Asking Rent $3.50/ sq. ft.

SOLD

4015 LOS ANGELES COUNTY GP

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

3096 NORTH BAY PERIO

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

4013 STANISLAUS COUNTY GP

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

4007 FREMONT PERIO

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

4011 SANTA ROSA GP

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

SOLD

4014 SAN FRANCISCO GP

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

SOLD

4012 SAN RAFAEL GP

Ready to start your own practice? Check out this turnkey ready practice opportunity with brand new state-of-the-art equipment: Panorex, inter-oral camera, digital x-ray in well-deigned 800 sq. ft. facility w/3 fully-equipped ops. Located on well traveled street close to hospital in strategically located professional building. Averaging 5 new pts. per month. Asking $275K.

4018 NAPA COUNTY GP

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

3094 NORTH BAY PERIO

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

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IMPLANTS

Axial displacement of screw-retained crowns with conical internal connections

Yilmaz B, Seidt JD, McGlumphy EA, Clelland NL. Displacement of Screw-retained Single Crowns into Implants With Conical Internal Connections. *Int J Oral Maxillofac Implants* 2013;28:803-806.

Aim: An in-vitro study to measure the axial displacement of screw-retained single crowns with conical internal connections in three dimensions after screw tightening by hand and torque driver.

Methods: A stereolithic acrylic resin cast (Accudental Inc., Golden, Colo.) from a patient with a missing maxillary central incisor was fabricated using computed tomography data. The resin, with an elastic modulus of 2,000 MPa was used because its elastic modulus is similar to that of cancellous bone (1,507 MPa). A 4.0 x 11 mm OsseoSpeed implant (Dentsply/Astra Tech, Waltham, Mass.) was coated with a thin layer of M-Bond 200 and placed into the missing maxillary central incisor. A polyvinyl siloxane impression containing the implant impression coping and analog was fabricated and used to transfer the implant position to the master cast. Five porcelain-fused-to-metal crowns (Ceradelta, Palladium-silver, Metalor, IPS d. SIGN Opaquer, Ivoclar Vivadent) were fabricated using cast-to abutments. The crowns were placed on the stereolithic model and hand-tightened by one prosthodontist until the screw did not move any further. The interproximal contacts were adjusted until an 8-um shim drags after the crowns were hand-tightened. A pair of high-resolution digital cameras was used to capture the images of the crowns. The cameras were positioned four inches apart with the lines of sight forming a 15-degree angle. The crowns were then torqued to 20Ncm and the interproximal contacts were re-evaluated. The 3-D DIC technique, which measures the dot patterns captured from the high-resolution images, was used to compare the displacement of the crowns after hand-tightening and torque-tightening.

Results: There was a horizontal movement (18um) of the crown toward the mesial and vertical movement (43.6um) of the crown into the implant after torqueing to 20Ncm. For the interproximal contacts, 8um shim dragged after hand-tightening, but tore as it was pulled through after the crown was torqued.

Conclusion: The differences in axial displacement between hand-tightening and torque-tightening need to be considered to avoid prosthetic and esthetic complications.

Clinical relevance: Laboratory technicians and dentists may hand-tighten crowns when making occlusal and interproximal adjustments. However, screw-retained crowns with conical internal connections should be torqued properly according to the manufacturer's guidelines before any adjustments are made. Although the axial displacement of the crowns may not be obvious in the posterior restorations, it may cause esthetic complications in the anterior restorations. A slight displacement of an anterior crown can alter the incisal edge position and anterior guidance.

— Gloria Khoo, DDS; Roy Nakamoto, DDS; and Arun Sharma, BDS, MSc

PUBLIC HEALTH

Factors affecting oral health care delivery during pregnancy

Kloetzel MK, et al. Oral health in pregnancy: educational needs of dental professionals and office staff. *J Public Health Dent* 2012 Fall;72(4):279-86.

Objective: A comprehensive guideline for the provision of dental services during pregnancy was published in 2006.[1] The objectives were to examine knowledge and attitudes of dental providers and nonclinical staff regarding dental care in pregnancy and differences associated with professional roles, and to determine if factors that affect the adoption of new innovations in medical care were associated with more accurate knowledge of preferred practices for dental care.

Method: A survey was used to collect information from 766 employees of a dental care organization in Oregon. It consisted of 12 multipart questions on the respondent's professional role in the dental office, perceived ease of incorporation of new ideas and willingness to change. There were five categories of questions on professional roles:

A. Overall health and pregnancy
B. Counseling pregnant patients
C. Efficacy of counseling and treatment
D. Provision of routine services
E. Provision of emergency services

There were six categories of questions on perceived ease of incorporation of new ideas and willingness to change.

Results: 546 employees responded. Dentists, hygienists and dental assistants each answered more correctly than nonclinical staff on

category A. Hygienists scored better than assistants did on category B. Dentists and hygienists scored higher than dental assistants and nonclinical staff on category C. There were statistically significant differences between dentists, hygienists and nonclinical staff on categories D and E. Multivariate analysis showed a positive perception of dental care during pregnancy was associated with more accurate knowledge of guidelines of clinical care. Respondents with formal dental education tended to score higher than nonclinical staff.

Conclusion: Authors concluded that the comprehensive evidence-based guidelines during pregnancy have not been adopted by the study group. Adoption depends on positive perception of the innovations, lack of contextual constraints and willingness to change.

Clinical importance: Dental care during pregnancy is important for the well-being of women and their children. In particular, it is a good opportunity to provide dental care to low-income women who may have time-limited benefits under Medicaid. There is a need for up-to-date education on this topic. Dental education institutions, dental organizations and policymakers need to educate oral health care providers and promote and facilitate the adoption of the 2006 guideline.[1]

REFERENCE

1. New York State Department of Health. Oral health care during pregnancy and early childhood: practice guidelines. New York State Department of Health; 2006.

– Mina Habibian, DMD, MS, PhD

PEDIATRICS

Anesthesia and children's behavior during treatment

Daidovich E, Wated A, Shapira J, Ram D. The Influence of Local Anesthesia and Complexity/Duration of Restorative Treatment on Children's Behavior During Dental Treatment. *Pediatr Dent* 2013 Jul-Aug;35(4):333-6.

Purpose: The purpose of this study was to investigate whether the region of local anesthetic injection and the complexity and duration of restorative treatment were associated with children's behavior during and immediately after dental treatment.

Methods: Data were obtained from charts of children 2 to 5.5 years of age from Jan. 1, 2008, to June 1, 2009, who were treated under conscious premedication with 3.7 mg/kg of hydroxyzine and 50% nitrous oxide/oxygen analgesia at the postgraduate dental clinic at Hadassah School of Dental Medicine and private offices of two of the authors. Inclusion criteria consisted of subjects who were classified as ASA I with no prior experience with local anesthesia and pre-cooperative behavior.

The subjects were divided into two age groups: children 2 to 3.5 years of age and children older than 3.5 to 5.5 years of age. The following information was accessed from the dental chart: region of local anesthesia (mandibular block versus maxillary infiltration), behavior during dental treatment and behavior after treatment was completed. Observers were calibrated accordingly.

Dental treatment that lasted fewer than 15 to 30 minutes was considered short and 30 minutes to 60 minutes was considered long. Treatment complexity was classified as simple (sealants, prophylaxis, and Class I and II restorations) and complex (SSC, pulp therapy and extractions). Topical anesthetic with 20% benzocaine and rubber dam were used for all procedures.

Results: Ninety children were included in this study. The mean age for the first group was 3.0 years of age while the second group was 4.5 years of age. There was an equal proportion of children receiving maxillary and mandibular injections, long and short appointments and complex and simple treatment.

Region of local anesthesia and behavior: No statistically significant difference was found during or after dental treatment within all age groups.

Complexity of treatment and behavior: No group had a statistically significant difference.

Duration of treatment: Behavior during treatment was associated with treatment duration for both the younger ($P<.001$) and older ($P>0.36$) groups. In the younger group, behavior immediately after treatment was significantly correlated to treatment duration ($P<.001$). In the younger group, behavior during treatment was significantly correlated to treatment duration ($P<.001$). Children who were uncooperative during treatment tended to be uncooperative at the end. In the older group, no significant correlation was found between treatment duration and behavior after treatment ($P=0.55$).

Treatment duration was the variable that most affected children's behavior at the dental office for younger and older children.

Conclusion: Lightly sedated children 2 to 5.5 years of age behaved less cooperatively during longer dental treatments.

Children 2 to 3.5 years of age behaved less cooperatively after longer dental treatments.

The region of local anesthesia and complexity of treatment did not affect the children's behavior.

– Thomas S. Tanbonliong Jr., DDS

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

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

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

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

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

6047 STOCKTON Best location outside Brookside Community on West March Lane. Annualized revenues of $540,000. Attractive 3-Op office. Package sale includes condo.

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

6044 MODESTO Best location. New development occurring nearby. Collects $380,000. Digital with computers in Ops. Very attractive office. SOLD

6043 EL SOBRANTE 3-day practice collected $170,000 in 2012. 3-Ops. Building optional purchase.

6041 PLEASANT HILL Collected $365,000 with Profits of $142,000 in 2012. Owner slowing down. Previous 3-years averaged collections of $415,000 and Profits of $180,000. SOLD

6039 CALIFORNIA'S SOUTH LAKE TAHOE Long established. 2012collected $515,000 with 3 months off. Realized Profits of $230,000+. Attractive 3-Op office SOLD

ALISO VIEJO Best shopping center location. Gross almost $1 Million. Gorgeous 5 Ops, digital & paperless. 70 New Patients/month. Part-time Owner. Full Price $945,000.

ANAHEIM Established 50 years. Grossing $30,000/mth part-time. Rent $2,700/mth for 2,000 sq.ft. 6 Ops. Full Price $220,000. Includes new $30,000 digital Dentrix upgrade and x-ray system.

BAKERSFIELD AREA Grossing $400,000 with full time Dentist. Full Price for practice and building $350,000.

BAKERSFIELD High identity dental building. Grosses $800,000. Established 50 years. 5 Ops. Successor should do $1 Million first year. Low overhead. Full Price $500,000.

DENTURE CENTER Over 30 denture patients/day. Grosses $1.3 Million. Patients not given option for implants as practice just does dentures. Full Price $1 Million. Specialist can take to $2 Million first year.

HEMET Long established. Thousands of patients. Grosses $650,000 part-time. Will do $1,000,000. Modern 10 Op office. Full Price $585,000. Seller will work back.

LA HABRA Female Asian. Gross $300,000, Hi Identity. Quality office, low overhead. Seller wants immediate sale. Relocating.

LAKE FOREST Hi identity shopping center with 5,000 insured employees across street. Modern 7 Ops includes Surgical op. Great lease, future Million Dollar office.

LANCASTER Proven shopping center location. Equipped & ready to go. Seller moved, needed more space. Many daily walk-ins. Grossed $900,000. collects $600,000+. Full Price $55,000. Stay 18 months and resell at $350,000 or more. Low overhead.

PASADENA AREA Grossing $900,000 part time. Did over Million when Owner had more time. High identity Dental Building also for sale. Seller to assist in financing.

REDLANDS Low overhead 5 Op digital office. Gross $30,000+/month. Full Price $350,000.

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

RIVERSIDE Grosses $875,000+. Can do $1,500,000 with right Buyer. Digital, 10 Ops in 3,000 sq.ft. Hi identity shopping center near Walmart. Full price $800,000.

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

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

VICTOR VALLEY Hi identity shopping center. Grosses $650,000. 8 Ops low overhead. Full Price $550,000.

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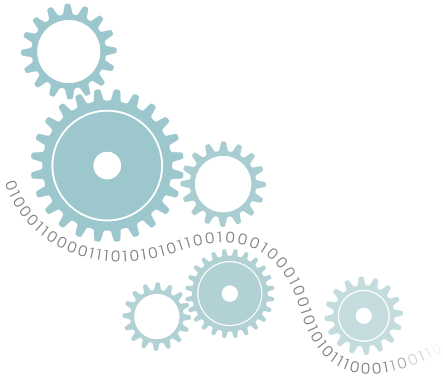

A look into the latest dental and general technology on the market

Toothsavers

(Partnership for Healthy Mouths, Healthy Lives, Free)

Dentists who want to help children improve their oral health have a new tool courtesy of the Ad Council and the Partnership for Healthy Mouths, Healthy Lives. The Toothsavers app allows kids to set out on a quest to fight evil bacteria of the mouth. It goes something like this, "Once upon a time in a land far, far away, a witch jealous of her neighbors' healthy teeth cast an evil spell on their mouths making their teeth dirty." The app sets up the game with this storyline and puts the onus on the kids to become a "Toothsaver" and break the curse by tooth brushing. The app is equipped with a timed, finger-swipe brushing game and a real-life tooth-brushing companion for kids and parents to keep track of their brushing progress, as well as morning and nighttime reminders. Throughout the game, which is geared toward children ages 3 to 6, tips are provided on how to brush molars, being gentle around the gums, brushing the tongue and more. "That bacteria doesn't stand a chance."

– Blake Ellington, Tech Trends Editor

All Events in City

(Amitech Business Solutions, Free)

From local sporting events and concerts to cause walks and class reunions, All Events in City allows users to easily find something to do on any given day in their city. With 10 million events loaded across more than 20,000 cities around the world (according to the developer), this app, available for Android and iOS, provides a unique list of activities for anyone at the touch of a button. Open the app and it automatically knows the users' location and gives them a list of cities nearby. Click on any city and a list of events, sorted by date, is available. Click on an event and users are given a description of the event, a map for directions and a button that will take them to a purchase page to buy tickets. Users also can see events that are trending around the world and establish their own profile to RSVP and save events. The app is available on both platforms, but the user reviews for the app on Google Play are higher than the reviews on iTunes (4 stars compared to 2.5 stars).

– Blake Ellington, Tech Trends Editor

Omnifocus 2 for iPhone

(The Omni Group, $19.99)

Omnifocus 2 for iPhone provides a fast method of capturing thoughts or ideas and allows the user to manage and organize them into meaningful to-do items. Capturing thoughts is as easy as tapping the inbox icon on the lower right side of any screen within the app or by asking Siri to capture the thought. Any captured thoughts or ideas in the inbox can be flagged or assigned to different projects or contexts as to-do items. Contexts can be location based where the user is notified of the to-do item when arriving or leaving a specified location. Users can also reference their to-do items based on the proximity of where an assigned task needs to be completed. Forecasts with unobtrusive color dots show what needs to be done and how soon items need to be completed. Users can see their tasks due compared with events in their calendar for the week. This app is an amazing and powerful tool made for busy, on-the-go individuals who need more than a simple laundry task list to be productive.

– Hubert Chan, DDS

Quora

(Quora Inc., Free)

Quora creates a user-generated question-and-answer experience. Quora software allows the aggregation of questions under general topic themes, creating easier searches for specific topics. Entering the search term 'dentistry' pulls up a long list of various questions and threads. Users can register with an email address or Facebook, Twitter or Google account. Full names, as opposed to screen names, are used along with a visible short bio, which helps determine the validity of some answers rather quickly. Security concerns have been raised and addressed regarding what users can view in terms of question searches for other users. Once signed in, users are prompted to choose five topics of interest. The tabs at the bottom of the screen have a Twitter-like appearance. There is a main feed showing answers and responses added to specific questions. An up or down vote is available as a form of like or dislike function. In open questions, users can choose to follow or add answers to threads and the center tab allows them to post their own question, similar to posting a tweet.

– Darien Hakimian, DDS

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