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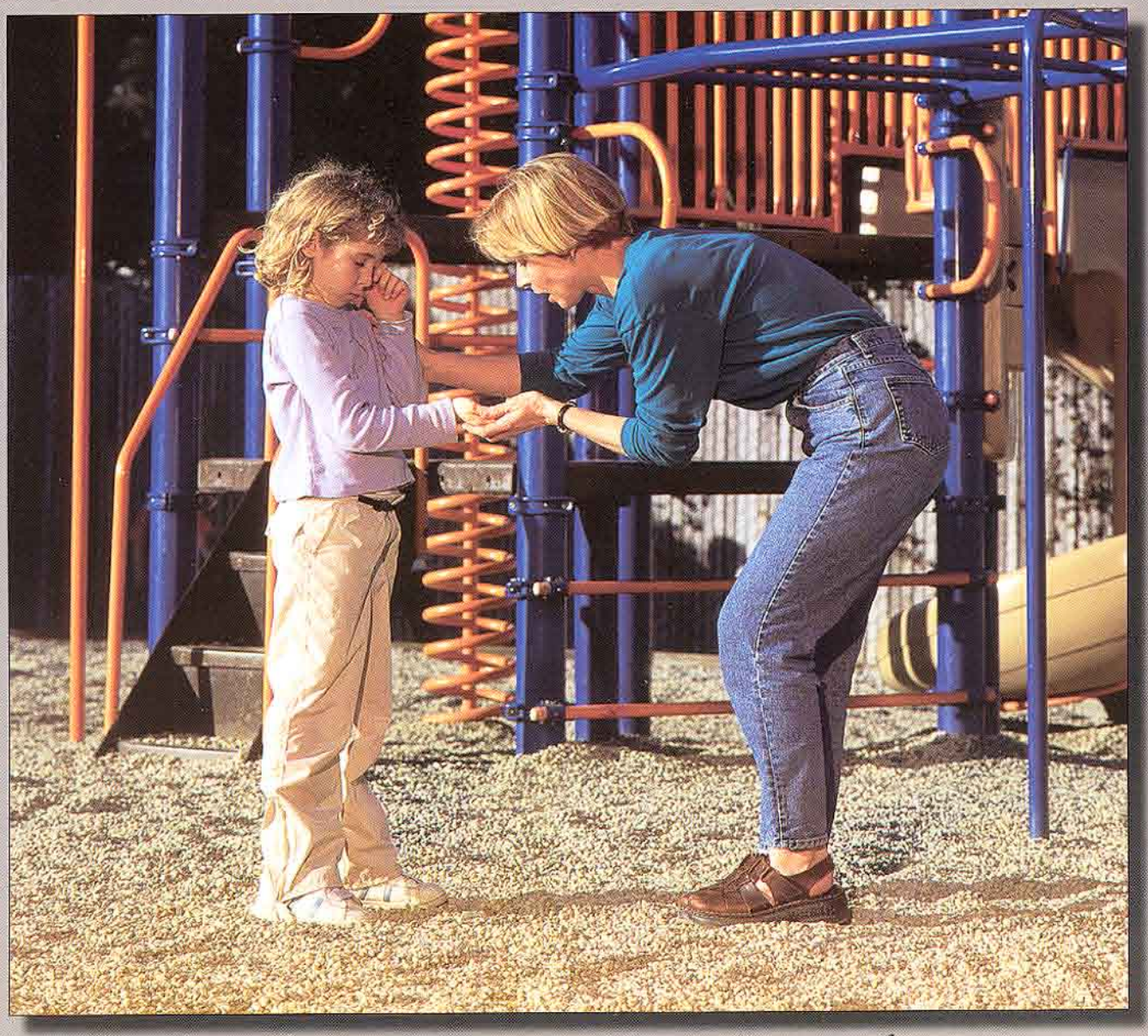
AVULSION: FACT & FICTION



David J. Kenny, DDS, PhD / Edward J. Barrett, DDS, MSc

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DEPARTMENTS

FEATURES

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The Era of the Private Enforcer

Jack F. Conley, DDS

The first year of the new millennium has already provided two attention-grabbing events that should have been of considerable interest to the dental practitioner. The first came with a sigh of relief and great sense of satisfaction that a long legal battle with a major governmental regulatory agency had finally been brought to a positive closure. The second may be the harbinger of an unexpected and continuing threat to the small-business owner.

The long-running case brought by the Federal Trade Commission against the California Dental Association over advertising guidelines dated back to 1985. This case, which began with the FTC's administrative complaint of July 1993 against CDA, has had a long history that will not be related here in detail. Last fall, the Ninth U.S. Circuit Court of Appeals received the case back from the Supreme Court and on Nov. 17, 2000, denied the FTC a rehearing, which was a welcome victory for CDA

At the conclusion of that decision, the FTC still had one remaining option -- to seek a further review from the Supreme Court. However, on Feb. 15, 2001, the FTC announced its decision not to seek further review and dismissed the complaint. Thus, the ability of the association to self-regulate by regulating member dentist advertising and thereby maintain quality and professionalism ultimately was upheld and reinforced. A key point in the CDA case was that professional regulation of dentist advertising can benefit consumers and encourage competition. The case had been widely watched, not only inside dentistry, but also by other professional associations.

At about the same time that the end of this long but successful journey was announced, an ominous threat to the daily lives of dental practitioners was beginning to cause anger and frustration. At the time of this writing, at least 80 dental offices had been served with 60-day notices by "private enforcers" citing violations of Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986.

The aspect of this activity that is probably most frustrating to dental practitioners is the fact that, as written, Proposition 65 gives individuals representing organizations the authority to enforce the law by filing suit. In other words, law offices representing environmental groups are able to carry out this "private" activity with almost no oversight, unless their action is legally challenged.

As has been reported elsewhere, the violations are for failure to warn about chemicals on the Proposition 65 lists that are known to the State of California to cause cancer, birth defects, or reproductive harm. Here is where the activity by the private enforcers seems to be somewhat arbitrary and in a sense, capricious. The materials and

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products that may contain the chemicals in question are FDA-approved as safe for use in dental offices. Further, the irony of Proposition 65 is that a business with nine or fewer employees is exempt from the requirement to post a warning, while those with 10 or more employees must post or face up to a $2,500-per-day fine for failure to do so.

It is our understanding that the citing of offices by the private enforcers has not shown favoritism as to the size of the practice, as dental practices of all sizes have been put through the process of having to respond to the citations, certifying whether or not they have more than 10 employees and, if they do, whether or not they have complied with the posting requirement.

The immediate challenge facing CDA is to identify a uniform and tasteful approach to notifying our dental patients of the chemical exposure. A 10-x-10-inch sign with "WARNING" in 1-inch high letters and including a statement that " composite and amalgam fillings, crowns, orthodontic brackets and wires and other materials used in dental treatment contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm" sitting in the middle of a dental waiting room, is NOT going to contribute positively to the dental experience. We have confidence that a more acceptable modality to inform patients will be designed and approved, hopefully before this column is widely read. CDA has encouraged the attorney general's office to promptly approve an alternative warning.

Most regulatory activity that small businesses face is administered by a local, state, or federal agency. This enforcement activity, while authorized by Proposition 65 law, is administered by private organizations, in this case with an apparent self-interest objective of raising funding for environmental causes. We are concerned that their enforcement activities will lack uniformity and fairness, given the lack of oversight of their actions. This activity also creates a seemingly unregulated opportunity for lawyers who have little interest in the proposition itself to line their pockets with what could translate into millions of dollars in payouts from small businesses.

This is an activity that must be watched closely, as an expansion of actions at this level could become a costly and public-relations-sensitive interference to dentists trying to provide health care services. Monitoring of this form of enforcement activity and its interference with the practice of dentistry will ideally fall into the province of CDA membership services during the era of the private enforcer.

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Table Clinics Offer View of Dentistry's Future

By Debra Belt

What kind of intellectual and scientific innovations lie in the minds of 21st century dental students?

The answers to this question and many more will be revealed at the Table Clinic Competition at the CDA Spring Scientific Session where more than 75 dental, dental hygiene, and dental assistant students from across the state will present their research.

This year, the table clinics have been extended to two days and will include research by military dentists. "There was an overwhelming response from participants this year, and CDA is pleased to offer the clinics on both Saturday and Sunday," said Sue Gardner, program coordinator for Scientific Sessions. This scheduling allows presentation of more than 70 table clinics and provides extended viewing time for those attending the session in Anaheim.

Military table clinic participants will have the floor in Exhibit Hall D of the Convention Center on Saturday, April 21, from noon to 2 p.m. Students from California's five dental schools and many dental auxiliary schools will give their demonstrations on Sunday, April 22, from noon to 2 p.m.

The table clinics offer dental professionals the opportunity to survey students' ideas and innovative techniques as well as gain one unit of continuing education credit. "The table clinics are another dimension of continuing education and offer practicing dentists a chance to extend their clinical awareness," said Ted Nakata, DDS, who has judged the competition for several years. Nakata notes the high level of academic pursuit in the table clinics and said students express great intellectual and scientific curiosity in their research.

"Dental professionals who attend the table clinics will see the future of dentistry," said Dennis Shinbori, DDS, chair of the Council on Scientific Sessions. "This is an opportunity to learn about the most up-to-date research and meet the talented new faces in dentistry."

In recent years, student table clinics have covered a broad spectrum of topics including testing the strength and adhesion of composite restorations, determining the development of the jaw by growth stages, and measuring bacteria in dental unit waterlines. In 1999, two Loma Linda students, Jerome Lee and Royce Nicola, won first place in the competition with a study of "The Antibacterial Effect of MTA mixed with Chlorhexidine or Tetracycline."

"This was an excellent topic for clinical application and very promising for treatment success in endodontics," Shinbori said.

The table clinics are judged by CDA member dentists and scored in three categories: subject matter, presentation, and table display. Students receive points for specifics such as timeliness, organization, scientific merit, brief and lucid presentation, professional decorum, and visual graphics. Judges work in teams so each clinic is surveyed by more than one team. In three rounds of judging, the group of 42 student table clinics will be narrowed to 10 to 12 semifinalists, and then four finalists will be selected in the categories of dental students, dental hygiene students, and dental assistant students. Cash prizes are awarded to first-, second-, and third-place winners; and each category has an honorable mention.

"I have never seen a bad table clinic," said Stephen Robin, DDS, who has judged the student presentations for the past four years. "The students are doing an intense amount of work and are engaging and professional."

Robin said some of the interesting clinics from past years include a comparison of tooth-whitening substances, testing of different solutions to eliminate the spread of herpesvirus, and studies of composite bonding techniques. "We are all interested in different things, and the table clinics appeal to a wide variety of interests ranging from cosmetic to clinical to dental materials."

Shinbori, Nakata and others involved say the quality and professionalism of the table clinics have been increasing. "It seems like students become more advanced in their studies each year," Shinbori said. He also noted the role of computer technology in the progressive quality and timeliness of clinic presentations. For instance, 1999 table clinic winner Melissa Wages created a Web site geared toward women's oral health in an effort to promote awareness of oral health as it relates to overall well-being.

"The student research answers relevant questions and addresses contemporary issues," Nakata said. "It's reassuring to be able to visit with students who are truly interested in their chosen profession."

Publisher Seeking Good Dental Stories

Have you got a great dental story? It might be worth $1,000.

Don Dible, co-author of Chicken Soup for the Dental Soul, is looking for stories, cartoons, poems, and quotes for his next book, Love is the Best Medicine for Dental Patients and the Dental Team.

Cash prizes of $1,000 will be awarded for the best story by a dentist, hygienist, and dental assistant. The book is expected to feature 102 stories. Each person who submits a winning story will earn 20 free copies of the book, and people who recommend quotes or who draw cartoons that are used will receive recognition in the Acknowledgment section.

The contest judges will be looking for "unforgettable true stories that will touch your heart, lift your spirits, heal your pain, make you laugh, and inspire you to celebrate the miracle of your humanity."

Unlike Chicken Soup for the Dental Soul, which was not sold in stores or by Internet retailers, Love Is the Best Medicine will be available to dental professionals and the general public through most retail channels.

Submissions may be mailed to Don Dible, Editor-in-Chief, DMD House, 1250 Oakmead Parkway, Suite 210, Sunnyvale,

CA 94085; e-mailed to dondible@dmd-house.net; or faxed to (408) 720-0624. The deadline for submissions is June 1, 2001.

Dentist Office Revenues Top $56 billion

Dental office revenue for 1999 increased at faster rate than revenue for health care overall, according to a Census Bureau report.

Revenue in dentists' offices increased 6.1 percent to $56 billion in 1999, while revenue for the nation's health care and social services sector increased 4 percent to $1.01 trillion.

The percentage gain for dentists' offices was slightly higher than the 4.7 percent increase recorded for physicians' offices (up to $202 billion) and 3.9 percent for hospitals (up to $4.13 billion) over the same period.

The health and social service estimates are part of the Census Bureau's 1999 service annual survey report. The survey provides estimates of revenue and other measures for most service industries based on information provided by dentists and other service providers. The report was released at www.census.gov.

NIH Launches Source of Alternative Medicine Info

From meditation to magnets, the vast popularity of unconventional medical therapies has risen sharply over the past decade -- to the extent that in 1997, Americans spent an estimated $21 billion out of their own pockets for these treatments. People decide to use complementary and alternative medicine, or CAM, for a variety of reasons; however, few CAM methods have been proven safe and effective.

Recognizing the need to provide authoritative CAM information, the National Center for Complementary and Alternative Medicine and the National Library of Medicine, two components of the National Institutes of Health, have partnered to launch a new CAM subset of a larger medical literature database that will provide free, Web-based access to CAM sources of information.

CAM on PubMed is a new subset of PubMed, a free system offered by the National Library of Medicine that provides an easy way to access more than 11 million citations and abstracts in the MEDLINE database and additional life science journals. MEDLINE covers nearly 4,500 journals published in the United States and more than 70 other countries.

CAM on PubMed provides direct access to more than 220,000 references and abstracts related to CAM, as well as provides access to many full-text articles.

"This joint venture will offer health professionals, CAM practitioners, researchers, educators, and consumers ready access to a comprehensive database of journal citations directly related to complementary and alternative medicine," said Donald A.B. Lindberg, MD, director of the National Library of Medicine.

For additional information about CAM on PubMed a question-and-answer fact sheet is provided at http://www.nih.gov/news/pr/feb2001/nccam-05.htm.

CDC Seeking to Cut U.S. HIV Infections in Half

The Centers for Disease Control and Prevention has announced a new program directed specifically at HIV-infected people and their partners to fight the spread of HIV.

The new approach to HIV prevention will involve intensive prevention outreach and services to those living with the disease. CDC estimates that new HIV infections could be cut in half in the United States by 2005, from an estimated 40,000 infections per year to 20,000 per year by:

- Sustaining current HIV prevention programs that target the estimated 5 million Americans at high risk for HIV infection; and
- Implementing intensive prevention outreach and services for the estimated 800,000 to 900,000 Americans currently living with HIV infection.

Rob Janssen, MD, director of CDC's Division of HIV Prevention -- Surveillance and Epidemiology, outlined the scientific basis for the approach and its estimated impact.

SAFE, the Serostatus Approach to Fighting the HIV Epidemic, initially focuses on expanding voluntary counseling and testing programs to reach all individuals living with HIV infection, including the estimated 200,000 to 275,000 Americans who are infected with HIV but don't yet know it. According to Janssen, there are several reasons to intensify efforts to reach infected individuals.

First, individuals who know they are infected can benefit from prophylaxis for opportunistic infections, monitoring of their immune status, antiretroviral therapy (when recommended), and, if needed, substance abuse and/or mental health treatment.

Second, studies indicate that after learning their HIV status, most infected individuals take steps to protect their partners.

Third, new HIV therapies, by lowering viral load, may reduce the degree of infectiousness. While antiretroviral therapy will not eliminate transmission of HIV, it could reduce it. At a population level, if risk behavior (condom use, sexual practices, and number of partners) remain unchanged, this reduction in transmissibility could significantly impact the course of the epidemic. Because antiretroviral therapy can have toxic and adverse physical side effects, decisions about when to initiate use of these drugs should be made by the person living with HIV in consultation with his or her physician.

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Ranks of Overnourished Equal Number of Undernourished

The world is trading in malnutrition for a heart attack.

Data from the United Nations indicates that while 1.1 billion of the world's 6.1 billion people receive too few calories, at least 1.1 billion eat too many, according to Gary Gardner, co-author of a Worldwatch Institute report on diet and physical activity. The rest get enough calories and exercise, but lack enough vitamins and minerals. Trends indicate that fat people may become the majority.

"We think that the number of overfed people on the planet is at its highest level," said co-author Brian Halweil, also of the Worldwatch Institute, an environmental research organization in Washington.

While agricultural advances have made food more available, that is not the only cause of the increase in flab. Technology has done its share by making it easier to get by on less work. Cars have replaced bikes, and TV viewing has replaced outdoor activity. "It's almost unavoidable to be lazy," Halweil said.

Urbanization also has a role, according to Dr. Victor Matsudo of Sao Paulo, Brazil, a consultant on physical activity to the World Health Organization. In Brazil, for example, urbanization has brought streets that are unsafe to walk and buildings that have replaced vacant lots where soccer games were once played.

Efforts to increase physical activity need to be made on the community level, according the Michael Pratt of the Centers for Disease Control and Prevention. Safe streets, pedestrian-oriented communities, and buildings that encourage stair-climbing instead of elevator riding are some of the changes needed in the United States and elsewhere.

"We are the worst or one of the worst, but there are a lot of other countries that are not far behind," Pratt said.

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Pre-Replantation Storage of Avulsed Teeth: Fact and Fiction

David J. Kenny, DDS, PhD; Edward J. Barrett, DDS, MSc

ABSTRACT Recent laboratory and clinical studies have proven that there is a rapid decrease in the regenerative potential of normal periodontal ligament the longer an avulsed tooth is out of the socket. These findings make some guidelines for the management of avulsed teeth inaccurate. This paper will review the effects of pre-replantation storage on periodontal ligament healing. In addition, current management recommendations are reviewed and suggestions for change presented.

AUTHORS

David J. Kenny, DDS, PhD, is director of dental research and graduate studies at the Hospital for Sick Children and professor of dentistry, University of Toronto, Ontario, Canada.

Edward J. Barrett, DDS, MSc, is coordinator of the Dental Trauma Unit at the Hospital for Sick Children and assistant professor of Dentistry, University of Toronto.

The ideal method for management of an avulsed permanent tooth is immediate replantation.1-3 However, immediate replantation continues to be the management exception due to accident-associated factors such as a child's emotional state at the time of injury, lack of knowledge or confidence of acute caregivers, and consent issues.4 The results of recent clinical and laboratory studies have led to a redefinition of immediate replantation from 30 minutes to less than five minutes. Consequently, delayed replantation is the only option that is available to clinicians by the time a patient arrives at a dental office.3,5-9 The preferred outcome for replanted teeth, periodontal ligament regeneration, is dependent upon the extra-alveolar duration and storage conditions prior to replantation.7,10-15 Both of these uncontrollable variables are largely in the hands of caregivers who do not have dental training.4

Although several consensus-based guidelines for management of avulsed teeth have been published, they are not entirely scientifically based, especially with respect to pre-replantation storage.16-20 This review is focused on the effects of pre-replantation storage on periodontal ligament healing. The facts and fiction of current management recommendations are reviewed, and suggestions for change are presented.

Periodontal Ligament Cells

Fibroblasts are the predominant cell type in the periodontal ligament and

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make up approximately 25 percent of all periodontal ligament cells. Although the origins and regulation of fibroblasts are not clear, it is currently thought that fibroblasts arise from a constantly renewing stem cell system. These still-unidentified stem cells (also called progenitor cells) produce different fibroblast phenotypes.21,22 Stem cells may be located adjacent to blood vessels in the periodontal ligament or within vascular channels of the adjacent alveolar bone.

Avulsion injuries rupture the periodontal ligament and immediately initiate a cascade of wound-healing responses. The periodontal ligament fibroblasts are critical for regeneration and repair and large increases in their formation and differentiation have been observed after wounding.21 Furthermore, the variety and function of fibroblasts that repopulate the periodontal ligament may dictate both the form and type of tissue that will be produced during healing.21,22 The healing pattern that occurs can either be regeneration of typical periodontal ligament tissues with normal function or repair with scarring. Scarring is characterized by replacement resorption of the root and ankylosis. While replacement resorption and ankylosis are expected outcomes and represent an acceptable result of replantation in an adult, they inevitably lead to gingival disharmony and infraocclusion following growth in pre-adolescents.

Unfortunately, most avulsions occur prior to the adolescent growth spurt.9 In these cases cellular metabolism and activity are accelerated compared with adults. The unsightly esthetics produced by infraocclusion often dictate that extraction will be the chosen outcome. If treatments are to be developed that will lead to regeneration of the periodontal ligament after avulsion, the ability to influence stem cell differentiation must first be developed. Only when this level of cell management is developed will prevention of ankylosis be possible.

Periodontal Ligament Cell Environment Following Avulsion

Acute Changes

- **Ischemic injury:** Ischemia occurs because the avulsed tooth becomes an inadvertent free graft. When free grafts are planned in periodontal surgery or solid organ transplantation, the tissue is maintained in chilled, isotonic, ion-balanced solutions to slow cellular metabolism. While the effects of ischemia on root-side periodontal ligament cells cannot be ignored, they are likely eclipsed by other acute factors.
- **Desiccation:** The drying of root-side periodontal ligament cells begins soon after the tooth is avulsed. The tooth may be held in a hand or a paper tissue or set aside to air-dry in the confusion that accompanies an avulsion injury. Almost all avulsed teeth experience a period of desiccation that may go unreported as it is often followed by placement of the tooth in a liquid medium for transport.
- **Chemical injury:** This is usually caused by imbibition and cell rupture due to immersion in media with inappropriate ion strengths. A variety of interim storage media have been suggested. Public education has encouraged the use of milk. Avulsed teeth are typically stored in milk; tap water; saliva; and, very rarely, ion-balanced solutions. Consequently, teeth often arrive with a "history" of chemical injury.
- **Mechanical injury:** Blunt trauma produces torn periodontal ligament fibers and ruptured cells, cementum, and blood vessels. Mechanical injury to the pulpal neurovasculature produces ischemic damage to the dental pulp.

Subacute/Chronic Changes

If the tooth has not been replanted, a blood clot will form in the socket. Inflammatory cells, the neutrophils and macrophages, migrate into the clot and prepare the way for development of granulation tissue. Fibroblasts proliferate and migrate into the coagulum as well. They produce dense connective tissue and differentiate into osteoblasts that form new bone.23 Connective tissue maturation may terminate the opportunity to replant a tooth as it becomes increasingly difficult to debride the socket to facilitate replantation. However, it has been shown in an animal model that socket-side changes favoring osteoblast and osteoclast differentiation occur less than two hours following an avulsion.24 Replantation may be subject to time constraints that are both cellular and mechanical.

If a tooth has been replanted, then inflammation is prolonged due to the complexity of the periodontal ligament cellular domain.25 If regeneration of a normal periodontal ligament is to occur, numerous cell types must form multiple junctional complexes. It has been hypothesized that periodontal ligament, bone and cementum cell populations arise from progenitor cells within the socket-side periodontal ligament and bone.21,22 Furthermore, the differentiation of progenitor cells is thought to be regulated by extracellular molecules and cytokines. For periodontal ligament fibers to insert onto cementum, avascular cementum must be repaired and infection must be controlled. The damaged cells attached to the root-side periodontal ligament will be removed by macrophages from the alveolar-side periodontal ligament . When the dental pulp becomes necrotic, toxic cellular breakdown products will leak through dentinal tubules where cementum has been torn loose during the avulsion.

A few days after replantation, a chronic inflammatory response characterized by proliferation of fibroblasts and liberation of a collagen matrix and vascular elements of the periodontal ligament begins and remains very active during the next couple of weeks. The inflammatory process is also associated with an infiltration of lymphocytes, macrophages and plasma cells into the periodontal ligament. Furthermore, bacterial infection will cause neutrophils

to release lysosomal enzymes that will cause local tissue destruction. Bacteria and foreign bodies introduced following replantation may further stimulate the chronic inflammatory reaction.21,22,26

Dentists must rely on clinical signs to determine the progress of regeneration or repair: altered mobility, percussion tone, and radiographic changes are important aids in the differentiation of the two processes. Laboratory studies that use periodontal ligament tissue from animal and human sources allow isolation of variables in order to observe the cellular aspects of the competing healing processes. While extrapolation to human healing is often difficult, much useful information has been gleaned over the past decade. Numerous investigations of periodontal ligament cell responses to storage media have yielded consistent results and provide a high level of scientific evidence. Furthermore, laboratory evidence of cell degeneration during extra-alveolar storage is largely supportive of reported clinical outcomes even though the influence of specific cellular mechanisms are unknown.

Laboratory Measures of Periodontal Ligament Cell Activity

Early studies that concentrated on measurement of cell vitality have been supplemented by assays of cell division, reproductive capacity, and immunohistochemical marker expression.

- **Cellular vitality.** There are a number of laboratory tests that measure membrane integrity, a requirement for cellular vitality. Stains such as Trypan blue attach to intact cell structures. Membrane integrity may be assessed by measuring the leakage of tritiated-uridine from cells. These tests do not offer any information about the functional, reproductive, or proliferative abilities of cells. Vital dye assays are only weakly correlated with tooth survival following replantation and illustrate the importance of newer functional test methods.

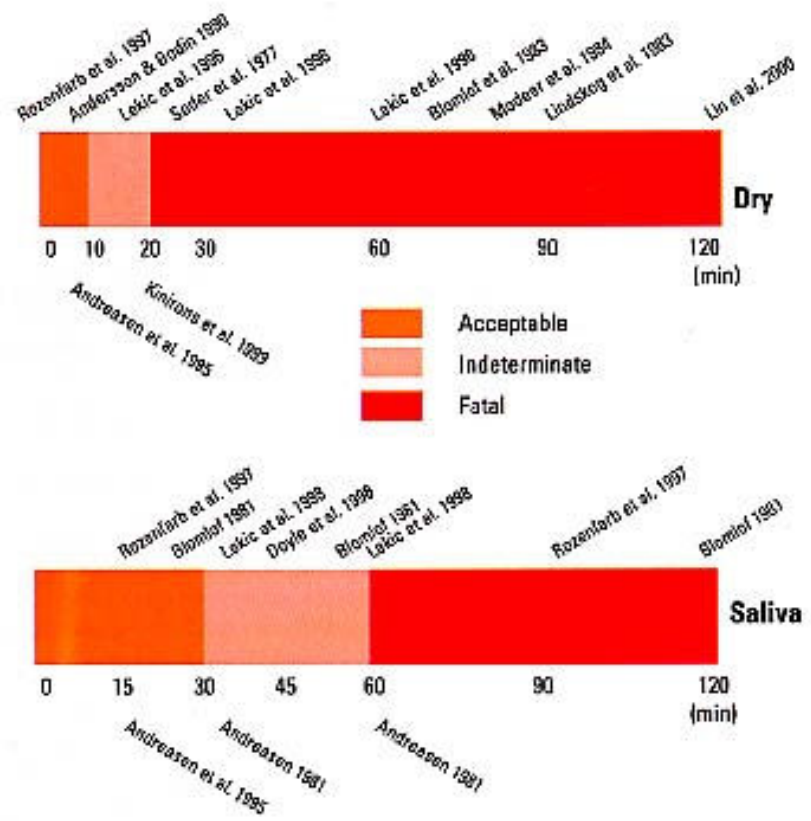

Figure 1. Effects of dry storage (top) and saliva storage (bottom). Time bars illustrate acceptable, indeterminate and fatal damage to cells that remain in the root-side periodontal ligament following an avulsion. Upper references are to cellular studies and lower references are to clinical outcome studies of teeth according to storage duration.

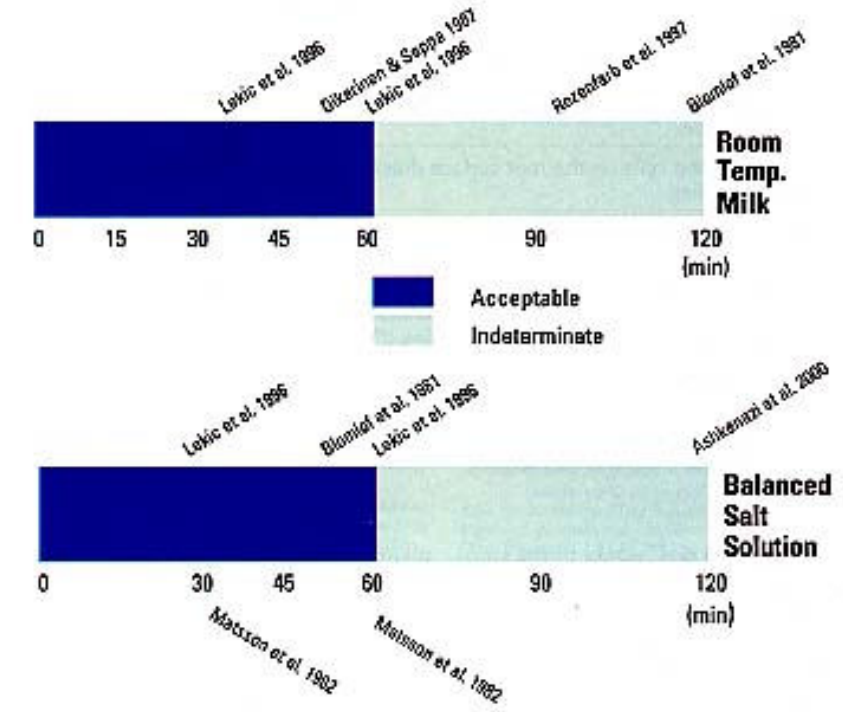

Figure 2. Effects of room temperature milk storage (top) and balanced salt solution storage (bottom). Time bars illustrate acceptable and indeterminate damage to cells that remain in the root-side periodontal ligament following an avulsion. Upper references are to cellular studies and lower references are to clinical outcome studies of teeth according to storage duration.

- **Plating efficiency.** Cells must attach to their substrate in order to synthesize and secrete matrix proteins. Measurement of cell attachment ability is called plating efficiency.
- **Mitogenic assay.** This test measures the functional capacity of all cells in a medium to attach to their substrate and proliferate. This total population assay includes both mature fibroblasts and progenitor cells. Uptake of 3H-thymidine by cells increases with increased mitotic activity and is a measurable parameter.
- **Clonogenic capacity.** This test estimates the proportion of progenitor cells in a population that demonstrate proliferative and colony-forming capabilities. It is presumed to be a measure of the ability of periodontal ligament cells to attach, proliferate, and recolonize the root surface following replantation. This test is most sensitive to changes in storage conditions.
- **Immunohistochemical markers.** These tests use antibody "probes" to identify the actual products of cellular metabolism. They give evidence of type, location, and amount of cellular byproducts and allow detection of changes in the activities of cell populations.

A number of cellular studies that have employed different methods are essentially in agreement. The laboratory studies are also consistent with clinical outcome studies by investigators from different centers. The evidence base for the effects of extra-alveolar storage on avulsed teeth is well-established.

Effects of Pre-Replantation Storage

- **Desiccation** is deadly (**Figure 1**). Outcome studies have demonstrated that even with immediate (in less than five minutes) replantation, normal periodontal ligament healing was evident in only 73 percent of teeth.3 By 10 minutes, only half the replanted teeth in a separate study exhibited normal periodontal ligament healing.2 By 15 minutes, an in vitro study of human periodontal ligament progenitor cells demonstrated that periodontal ligament cells exhibited a very low ability to reproduce themselves (clonogenic capacity 4.5 percent), and by 30 minutes periodontal ligament cells were incapable of reproduction.11 Desiccation appears to select for osteogenic cells at the expense of periodontal ligament fibroblasts. This would increase the incidence of ankylosis with time.28 Numerous investigators have demonstrated early effects of desiccation 29-31 while others have shown that within 30 to 60 minutes of desiccation all periodontal ligament cells die.14,27,32
- **Water** is acceptable for storage for up to 15 minutes if there are no alternatives. Cell damage due to imbibition is inevitable, but it is less damaging than desiccation for this very short period.33,34
- **Saliva** is as safe as room temperature milk for up to 30 minutes (**Figure 1**) as periodontal ligament progenitor cells retain an acceptable clonogenic capacity (7.6 percent). However, storage in saliva results in a precipitous decrease in functional capacity within 60 minutes. Separate studies support the acceptability of storage in saliva for up to 30 minutes. 12,35,36
- **Milk** is acceptable for up to 60 minutes based upon its ability to support the clonogenic capacity of periodontal ligament cells even if the milk is allowed to warm to ambient temperature (**Figure 2**). However, if the milk is kept chilled, the cooler temperatures reduce cell swelling, increase cell viability, and improve cell recovery.12,29,37 Clonogenic capacity can be maintained at the same level for an additional 45 minutes simply by keeping the milk chilled in an ice pack or refrigerator.35 There is only anecdotal evidence that storage on ice leads to extensive root resorption.3
- **Balanced Salt Solution** is similar to milk but is not superior (**Figure 2**).13,22,35

Fact and Fiction

Recent investigations have focused on sophisticated and rare storage media such as balanced salt solution (an ophthalmic irrigating solution) or ViaSpan (a tissue culture medium). However, numerous cell biology and clinical outcome studies have clearly identified desiccation as the principal avoidable threat to root-side periodontal ligament cells. Desiccation for as few as 15 minutes has profound effects on progenitor cell growth and differentiation. If a tooth has been dried for 30 minutes, there will be no functional periodontal ligament cells on the root, and by as few as 45 minutes all periodontal ligament cells will be dead. Patients often arrive at hospital emergency departments or dental offices with avulsed teeth in milk. Meticulous record taking of the extra-alveolar history of the tooth will often identify a desiccation time of more than 30 minutes while milk was located or an extended (more than 15 minutes) exposure to tap water. Either condition will lead to selection of osteogenic progenitor cells or simply kill all cells on the root-side periodontal ligament and render subsequent storage media irrelevant.

The patient's bloody saliva is always present at the point of injury and should be used immediately to prevent desiccation. Guidelines should emphasize the need for immediate hydration with saliva (less than 45 minutes) or water (less than 15 minutes) while securing milk and ice. The safety of both of these time intervals is supported by a number of in vitro investigations. Although the patient's own saliva is acceptable and immediately available, the recommended use of the buccal sulcus for storage should be reconsidered as risky and unnecessary in a traumatized child who may be upset and crying. It would be safer for the patient to spit or drool into a receptacle and keep the tooth wet in the saliva-and-blood mixture while a better storage medium is

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sought. It is easy to forget that except for the rare cases when a dentist is either a coach or just happens to be present, the primary caregiver for dental injuries is most frequently another parent or simply a passerby.

Milk and ice can usually be procured within a quarter-hour while the patient's saliva protects the tooth from desiccation. Milk will protect periodontal ligament cells beyond two hours if the milk is packed in ice or kept in a refrigerator. The value of storage at 39 degrees Fahrenheit is strongly supported by cell studies and medical practice for solid organ transport and should be encouraged. Cell physiology studies have shown the protective effect of low-temperature storage on root-side periodontal ligament cells. However, the linkage to improved clinical outcomes such as periodontal ligament regeneration, replacement resorption, ankylosis, or prolonged survival has not yet been made. This linkage will be difficult to demonstrate in humans due to multiple confounding variables.

American Academy of Endodontics guidelines still state that inflammatory resorption, replacement resorption, ankylosis, and tooth submergence are potential complications of replantation. Evidence supports these clinical signs as expected outcomes rather than potential complications. In fact, virtually all replanted teeth will eventually be extracted for a variety of reasons that can include root loss due to inflammatory resorption, unsatisfactory esthetics due to infraocclusion, or crown fracture as a consequence of marginal resorption. Survival following replantation is greater for patients who are in late adolescence or adulthood when they sustain their injury.

The use of balanced salt solution seems to have found its way into some guidelines with a modicum of scientific support. For instance, Krasner38 cited the work of others as evidence that storage in balanced salt solution may "reconstitute" periodontal ligament cells. Cvek and colleagues10 and Matsson and colleagues39 assumed that storage in isotonic medium would wash off breakdown products of autolysed cells that acted as a substrate for bacteria or as a chemotactic agent for inflammatory cells.10 The clinical outcome study by Andreasen and colleagues found that a combination of wet and dry storage resulted in a significantly lower healing rate for teeth stored for greater than 20 minutes and saline storage significantly decreased periodontal ligament healing in teeth stored dry for up to nine minutes.3 For teeth allowed to desiccate for longer durations, no significant difference could be found in periodontal ligament healing rates between dry storage and dry storage followed by saline storage.3 Matsson's group studied replanted dog incisors that had been stored in either dry conditions, dry followed by balanced salt solution, or in balanced salt solution alone.39 Even though ankylosis was significantly reduced in teeth stored in balanced salt solution, the percentage of root sites with external resorption was approximately the same for teeth stored dry (16 percent) and teeth stored dry followed by wet storage in balanced salt solution (14 percent). Therefore it cannot be concluded that balanced salt solution rejuvenates degenerating periodontal ligament cells from the results of this study alone.39 Whether "reconstituted" cells are phenotypically/physiologically normal is unknown as no studies have been conducted to determine the properties of "reconstituted" cells.

Krasner and Person investigated the success rate of replanted teeth that had been stored in balanced salt solution in a study with multiple methodological and data-interpretation problems.40 They stated that teeth with an extra-alveolar duration of from 15 to 120 minutes that were subsequently stored in balanced salt solution showed a "success rate" of 91 percent. This included teeth that showed radiographic signs of root resorption. There was no indication that a standardized protocol for the treatment of the avulsed teeth such as the American Association of Endodontists recommended guidelines was followed.16 Interexaminer variability was not evaluated statistically for radiographic interpretation of ratings, and the data did not describe initial storage conditions and extra-alveolar duration before placement in balanced salt solution. Therefore, it cannot be concluded whether "success" at the 30-month interval was related to the storage treatment, the extra-alveolar duration before replantation, or both.

Due to the many variables in this study, the conclusions made by Krasner and Person that balanced salt solution reconstitutes periodontal ligament cells cannot be substantiated.40 Similarly, none of the previous studies produced evidence that balanced salt solution storage following dry storage "reconstitutes" periodontal ligament cells. The definitive study of Doyle and co-workers showed no significance with or without soaking desiccated human periodontal ligament

Table 1. Advice for Parents and Caregivers

1. The most important factor for healing is immediate (less than five minutes) replantation.
2. Drying of the cells on the root surface drastically reduces their ability to assist healing.
3. Replantation is always superior to storage out of the mouth.
4. Immediate storage in the patient's own saliva followed by transfer to cold milk will maintain the root surface cells' ability to assist healing for up to one hour.
5. Keep the milk (and tooth) cold by packing the milk in ice during storage.
6. The first person prepared to replant the tooth should do so. Do not wait for a dentist.
7. Water storage damages root surface cells. Use water to rinse the root before replantation if saline is unavailable.

cells in either balanced salt solution or milk.41 This study further emphasized the fatal effects of 30 minutes of drying on root-surface periodontal ligament cells. Clearly the weak evidence for resurrection of periodontal ligament cells with balanced salt solution should be considered inadequate to support recommendations for such treatment in humans. Furthermore, the concept of cellular resurrection with balanced salt solution should not be considered for inclusion in guidelines.41

Only if a tooth has been protected from desiccation and potentially hostile storage conditions should it be considered a candidate for long-term (more than 2 hours) storage if early replantation is an option. Ashkenazi and co-workers have recently shown that beyond two hours, room temperature balanced salt solution is an acceptable storage medium as long as viable cells are present.42 Nevertheless, the survival of root-side periodontal ligament cells has still not been linked to prolonged survival of replanted teeth.

In fact, storage media and methods are available to prolong the viability of root surface periodontal ligament cells even though they may select for osteogenic phenotypes rather than periodontal ligament fibroblasts. The fiction is that once periodontal ligament cells are dead, they can be resurrected by dipping them in balanced salt solution, milk or any other medium. It is also fiction for dentists to delude themselves or their patients with the belief that replanted teeth will last as long as normal teeth. The available literature clearly demonstrates that unless an avulsed tooth is immediately replanted, it is destined to fail as a result of progressive root resorption.2,3,6,9 Extraction can be as early as one year in a preadolescent with immature roots to decades for adults with fully formed roots. Table 1 illustrates the authors' interpretation of an evidence-based storage protocol.

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To request a printed copy of this article, please contact / Dr. David J. Kenny, DDS, PhD, Department of Dentistry, The Hospital for Sick Children, 555 University Ave., Toronto, Ontario, Canada, M5G 1X8 or at HSCDent@sickkids.on.ca

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Key Factors in Determining a Dental Practice Site

Scott McDonald

ABSTRACT There is no single "right" place to place a dental practice. Personal preferences, family, friends, church, and recreation all have a hand in determining a dentist's likelihood of happiness with a particular location. Still, the science of demographics and psychographics (who people are and what they do) can provide a dentist with necessary insights into knowing the potential of a location. This article discusses important demographic and psychographic information that should be considered when determining a dental practice site.

AUTHOR

Scott McDonald is president and owner of Scott McDonald & Associates in Sacramento. He provides demographic and psychographic research and analysis; mailing lists; and programs on site analysis, marketing, and customer motivation for dental practices and other small businesses.

As the practice of dentistry has developed over the past 100 years, rules for finding the most favorable sites to situate a practice have changed. From town centers to strip malls, there are rights and wrongs for practice site selection. Naturally, there will be exceptions to those rules because there are often mitigating circumstances that supercede generalities. Nevertheless, the rules should be ignored only after considerable thought has been given as to the reason. This article discusses important factors in determining a dental practice site. These factors are listed here in order of priority, although it is possible that certain secondary or tertiary aspects may be strong enough to overcome those usually of higher priority.

These factors are the result of observations made after analyzing the locations of 200 general dental practices throughout California between 1995 and 2000. The site-specific information was judged against the dentist's perceived happiness at the practice location. No attempt was made to evaluated practice productivity, profitability, or other objective criteria. Although general practices were studied, the underlying logic regarding these factors should be applicable to specialists as well.

Population and Households

It is vital to any practice to have sufficient numbers of people to treat. Without patients, there can be no practice.

But the simple population statistic can be deceptive. For example, the population of an area should not be considered in terms of night-time, or resident, population alone. In many cases, the daytime population of an area may be far more important. This is especially true of areas dominated by large employers in office buildings surrounding a practice site. The resident population may be poor, while the daytime population may be quite desirable.

In addition, with regard to the raw numbers of people in a given geography, a dynamic population is preferable to a static one. Many areas have a large but stable population. Often homeowners don't move for decades. Generally speaking, this type of population tends to be tied to their current dental practices. If, on the other hand, there are many new residents either because of immigrants to the local area or a net increase in the number of housing units, the number of available patients will be higher. For this reason, an area with little growth or an aging population will not be as desirable as one that is growing or at least changing.

Determining the critical mass of population necessary to justify the establishment a dental practice is not a simple matter. It is tempting to provide an optimum population-to-dentist ratio to evaluate the value of a site. But not everyone within a population seeks dental treatment. Women seeking treatment usually outnumber men by 10 percent.1 Blue-collar workers seek treatment less often than white-collar workers.1 Older patients are more faithful referrers than young ones.1 For this reason, demographic statistics beyond just overall population numbers are required to evaluate a potential site.

Assuming the other statistics show a population that is affluent, fairly well educated, and motivated to seek treatment, the population-to-dentist ratio can be as low as 1,100-to-1. On the other hand, practices can suffer for want of available patients in areas with 5,000-to-1 ratios. In short, the character of the population, more than its size alone in numbers, is a crucial statistic. To substantiate this, from 1995 to 1999, 25 practices were requested to provide a survey regarding the income levels of patients. Production levels were applied to people in each income category. Not surprisingly, patients who earned more also spent more disposable income on dentistry.

Convenient Isochrones

An "isochrone" is a distance measured in time.2 Due to the advent of the automobile, most people determine distance by how long it takes to get from one spot to another. A receptionist in a dental practice may say, "It takes 15 minutes to get to our office." There is a limit to how far a particular demographic group will travel to a dental office. As a general rule, the more densely populated an area is, the less time people are willing to spend on traveling to offices for professional services.

The science of isochrone analysis for retail business is well-documented. In retail demographics, the term retail trading zone equates to a geographic patient base. But the rules for determining a geographic patient base are somewhat different. For the sake of this article, it will be said that a geographic patient base can be determined in isochrones.

The difference between a practice area in North Hollywood and one in Palmdale is primarily that the commute times in the Palmdale area are much longer than in most parts of North Hollywood. Palmdale will tend to draw from a much more scattered population. For this reason, a map showing the relative practice area of a rural or isolated suburban population will show more square miles than one in an urban area. This is important because even though there may be relatively few people living and working around a particular practice site, the practice map will take in more area. When considering the ideal population-to-dentist ratio, it is necessary to accept that a set radius will not provide sufficient information. A four-mile radius in Merced is not the same as a four-mile radius in Sacramento.

Isochrones are also important because they relate to the distance between a practice and large transportation arteries with high speeds. Close access to an interstate or expressway off-ramp means that people are often willing to travel from a greater distance because the time it takes to get to the office is shorter. An isochrone map will show that the potential reach of a practice is longer along highways than along unpaved streets.

Age

Age is the third most important population factor for determining the value of a given practice site. This is due to the simple fact that age so often predicts dental need. For example, pediatric dentists will want an area with a lot of children age 3 to 10 and orthodontists will want an area with a lot of youths age 10 to 18. Most dentists already understand the relationship of age to given dental procedures. They know that 18- to 25-year-olds do not often seek treatment of any kind (with the exception, perhaps, of third molar extractions) because their physical condition is as good as it will be in their lives and because they don't have adequate money or insurance to pay for care. Conversely, people 45 to 60 years of age often have significant dental need and financial resources. Insurance actuaries have long understood this relationship between age and health care need and therefore tend to increase insurance premiums with age.

Age can be analyzed in three ways:[3]

1. Absolute numbers of population broken out by age;
2. Relative distribution of ages; and
3. Median age.

The first figure shows how many people of a specific age are in a given geographic area. This will help provide

an idea of how many age-related dental procedures will be necessary for a base population..

The second measurement takes the entire population and breaks it out into age groups by percentage of the total population. This is particularly useful in comparing one area of similar size to another. It tends to show the "character" of a population.

The third measurement, median age, is figured by taking the ages of everyone in the community, plotting them on a graph, and finding the age that falls in the middle of the bell curve. This statistic is good for comparing one area to another but is also helpful to use as a marketing demographic for direct mail. Typically, if one were ordering a mailing list, one would choose heads-of-household who fall near the median age. Median age also figures prominently in determining a psychographic profile (which is discussed later).

It is extremely useful to compare the median age of a practice area to the median age and age distribution of a practice. This exercise will indicate how closely the practice's patient population matches the community profile. Based upon the author's internal polling of dentists in transition (selling their practices or taking on a new partner), most dentists who have worked in a practice for five years or more will have a median age for their practices within five years of their own age, either younger or older. It is crucial, therefore, for a purchasing dentist to consider whether the practice is being sold by a much older, retiring doctor. A patient base that is much older than the prospective buyer could have less loyalty and require additional marketing efforts to replace patients who move on. This case has not been proven statistically, however.

Local Economics

Just as an investor may make a fortune off a single stock while the rest of the stock market is down, local economies can differ from state or national economies. Each practice area has a different economic potential from the larger geographic setting.

The local economic outlook is determined by several factors, such as household income, consumption potential, and employment.

Household Income

Similarly to age, household income can be looked at in three ways:

1. Absolute income earned;
2. Relative distribution of incomes; and
3. Median income.

It is possible to find out how much money is being produced or earned in a given geography. Perhaps the easiest geography to comprehend is the zip code. Its boundaries are well-defined, and it is useful as a marketing area.

It is also possible to determine the relative categories of income that are being earned per household. For example, it is useful to know how many people per zip code earn:

- Less than $15,000;
- $15,000 to $25,000;
- $25,000 to $50,000;
- $50,000 to $100,000;
- $100,000 to $150,000; and
- 150,000 or more.

These are the standard categories used by the U.S. Census Bureau. From these categories, one can extrapolate the percentage of people earning each of these incomes for use in comparing one geographic area to another.

Median household income is useful in the same was as median age to determine a character of the population as well as for making marketing decisions.

Consumption Potential

People spend money on different things. Demographers have long tracked the various things that people buy to determine the nature of the population's choices. For example, if people in a given area spend a great deal of money on investments, they most likely have investment income. Therefore, this population is meeting its other financial obligations to the point that they have disposable income. There are many categories of consumption potential4 that can be measured. A few examples include:

- Insurance;
- Home repair;
- Pet supplies;
- Health insurance;
- Movie rentals; and
- New car loans.

Most of the time, consumption potential is expressed as an index. This index has a baseline of "100" which represents the national norm. Any score above or below this line indicates there is more or less spending than the national average in that category for that geographical site.

Employment

Some areas have a single large industry as their chief economic base. For decades Monterey, for example, depended upon fishing as the main base of its economy. When demand, technology, and foreign competition threatened that industry, a financial crisis ensued. This is also the case in many "rust belt" communities that depended upon a single large factory or plant for most employment.

Diversity in the economic base is much more common than ever before. Nevertheless, many communities continue to be dependent upon one or two industries for support. At first glance, it appears that some of those industries are immune to market forces. Such was the thinking of several communities in California, such as Sacramento, that had military installations. When the federal government decided to close four military bases in the Sacramento area, however, dental practices had to scramble to reconsider the economic base of their patients. Property values shifted as did insurance plans, population growth and character, and transportation patterns.

Those parts of California that depend mainly upon government granted funding (including colleges and universities), tourism, and the military may look secure but are not always.

Many sites depend upon the economies of surrounding communities. This is certainly true of suburbs. Residents earn their money elsewhere and return home with it, sometimes crossing state lines in doing so. In fact, these communities tend to have more inherent stability because they draw from several diverse sources for their ultimate economic base.

Another type of economic base is the "retirement community." In this case, people have earned their money elsewhere (often in a different state) and are spending their savings and retirement income to live. For that reason, retirement communities are often the communities with the most stable economic outlook.

It is useful to consider the ratio of employers to employees per geographic area (such as a zip code) as it will reveal the impact of a specific business or industry upon the practice base.

Psychographics (Lifestyles)

While it is very useful to determine the individual characteristics of a population, demographers have created a kind of short-hand to look at groups of people. They classify them according to the characteristics they have in common. Using algorithms of available data, they have divided the U.S. populations into several lifestyle "clusters."5 The various vendors of this information differ in the number of categories (from nine to 50), with each company using its own algorithms to determine the differences between them.

As an example, Claritas owns a market research company called National Decisions Systems. Their MicroVision profiles contain 50 lifestyles clusters. These clusters carry names that are somewhat descriptive. Two groups found in large numbers in California are "Good Family Life" and "Urban Up and Comers."

Good Family Life

People in this cluster are typically high income, married couples with children. They live in owner-occupied single family detached units in rural areas. They have a high level of education and work in white collar occupations.

Good Family Life adults are more likely than average to be in the age ranges between 40 and 54 years and are more than 10 percent more likely than average to have children ages 10 to 17. Their median household income is 66 percent above average, ranking them eighth overall, and they have the highest concentration of white households (96 percent). These adults are the third most likely to be married (19 percent above average) and third most likely to live in owner-occupied and single-family detached housing. More than 80 percent of these households live in rural areas, which is more than three times the national average. They are found in particularly high concentrations in the rural parts of New England, the Midwest, and the West. Although they are primarily located in rural areas, their property value is more than 50 percent higher than the national average. They rank second in having an associate degree and are about 40 percent more likely than average to have a bachelor's or postgraduate degree. They are 15 percent more likely to have a white collar job, ranking highest in technical support occupations (11th) and executive and managerial occupations (12th). They are the fourth most likely to drive alone to work and have an above-average commute time.

This segment is very likely to own a variety of sports equipment and to participate in various sports including skiing, racquetball, boating, hiking, and golf. They are the most likely segment to own a gas grill and are more likely than average to drink Coors Light beer.6

Urban Up And Comers

This population cluster consists of singles, primarily living alone, in rental property. They live in urban areas, have a high level of education, have medium-high income, and work in white collar occupations.

Adults in this segment are more likely than average to be between 18 and 39 years old. In fact, they have the highest share in the 30- to 34-year range. More than 58 percent of these households contain one person (ranking second overall) and they contain primarily singles living in nonfamily households (ranking first). While more than 70 percent of these households are white, they have the fourth-highest share of Asian households (more than three times the national average). The median household income is 8 percent below the national norm, but the per capita income is 48 percent above average. This is an almost entirely urban segment with 93 percent of these households living in cities. They score highest in the cities of Washington, D.C.; Chicago; Boston; and San Francisco. Educational attainment is well more than average. This segment has two and three times the average percentage with bachelor's and postgraduate degrees, respectively. More than 78 percent work in white collar occupations, particularly in technical support, a professional specialty, and executive and managerial positions. Also indicative of their urban concentration, they are much more likely than average to rent (83 percent are renters), they rank third in living in structures with 10 to 49 units and fourth for structures with 50 or more units. They rank third in taking public transportation to work, and they rank fifth for having no vehicles in the household.

Urban Up and Comers are the most likely to do their banking with an ATM card, subscribe to voice mail, and to use a PC for a variety of online and Internet functions. They are also very likely to have an educational loan; drink imported beer and wine; and have dental, renter's, and accidental death and dismemberment insurance.6

Obviously, these two lifestyles are quite different. The relevance to dentistry is most clear when one considers that each group will have its own particular wants and needs for dental care. As a rule, single populations are more mobile. They represent most of the new patients found in any given geography. They are also less stable and more difficult to establish a relationship with.

Knowing lifestyles or psychographics is important because it can provide valuable insights into:

1. The nature of the wants and needs of a population for a particular treatment, location, method of practice, or payment model;
2. The media and messages used to market to them so they can be done most cost-effectively;
3. Inappropriate or undesirable lifestyles that can be avoided as the targets for marketing; and
4. How a practice's patient base can be analyzed to determine how alike or dissimilar it is from the general population.

This information on psychographics is invaluable, therefore, in evaluating a practice site and practice database. It is also very useful as a tool on which to base future internal and external marketing activities by providing a rational target market that will be the kind of patients the practice most desires. While this information is very useful, it can become a quixotic search to find the "ideal" psychographic group or segment. Some dentists are lured into seeking a population that fits a particular lifestyle they would like to serve rather than looking at the populations near their current practice that they might serve well. For example, some dentists' searches for desirable demographics might lead them to areas dominated by affluence, such as San Francisco, Sunnyvale, and Beverly Hills. Unfortunately, competition and high overhead often accompany these locations.

It is better to find the best patients within a particular market than to find a market with a particular kind of patient.

Summary

This article has discussed those factors that a dentist should consider in determining a dental practice site. This information is available through private data vendors, marketing firms, and government agencies. Beyond the simple facts about what people are (demographics), knowing what people do (psychographics) can provide the dentist with necessary insights into knowing the potential of a location and how to market to the "ideal" target markets within the area effectively.

The famous Temple of the Oracle at Delphi has engraved above it, "Know Thyself." Using modern demographic and psychographic research, it is both possible and practical to "know thy practice site" so that these important and risk-filled decisions can be made rationally. There is no single "right" place to place a practice. Personal preferences, family, friends, church, and recreation all have a hand in determining a dentist's likelihood of happiness with a particular location. Still, to the degree that objective criteria can be known and evaluated, the science of demographics can be a valuable tool.

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To request a printed copy of this article, please contact/ Scott McDonald & Associates, 5013 Harebell Court, Sacramento, CA 95842 or at demographics@cs.com.

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The Impact of the New Alternative Work Schedule on Dental Offices

Bette E. Robin, DDS, JD

ABSTRACT Wage Orders 2000 and 2001 substantially changed the way the alternate work schedules used in many dental offices may be structured to avoid the payment of daily overtime.

AUTHOR

Bette E. Robin, DDS, JD, has a law practice focused on practice transitions, employment law and general business concerns of the health care practitioner.

The daily payment of overtime compensation to employees is a source of great confusion to many dentists. Most dentists want to properly compensate their employees, not only out of a sense of fairness, but also to avoid the substantial legal liability that may result from improper compensation. Determining correct compensation can be difficult at best, especially with the seemingly ever-changing laws. Those who think they have it right, probably do not. Even if they did at one time, the law has probably changed since then. This article is a review of the current daily overtime compensation requirements for dental offices and the potential use of alternate work schedules to avoid some of that overtime. This article does not constitute specific legal advice, and appropriate legal professionals should be consulted in the event a dentist wants to make changes in his or her current compensation scheme.

Overtime/Alternate Work Arrangement Review

California Gov. Gray Davis signed the Eight Hour Day Restoration and Workplace Flexibility Act of 1999 in July of 1999 and it took effect on Jan. 1, 2000.1 One of the act's main purposes was to provide for daily overtime. Simply, it requires that employers pay employees overtime at time and a half for hours worked over eight in a single work day or over 40 in a single work week.2 To facilitate this new regulation, interim wage orders were adopted that amended the state's labor codes and the alternate work schedule. Most practical uses of an alternate work schedule by the practicing dentist were effectively abolished. The interim wage orders seemed to require an employer to "guarantee" an employee all the hours stated on that employee's alternate work schedule. That is, the employer-dentist had to pay all 10 hours every day, regardless of whether those hours were actually worked under the interim wage orders.

Since that date, the Labor Commission in California has gone through a tortuous path in attempting to clarify and define the new regulations, including the alternate work schedule. A great deal of input was considered from both employer and employee groups. On June 30, 2000, at a public hearing of the Industrial Welfare Commission, the interim wage orders were amended, and 1989 wage orders were temporarily reinstated except where the 1989 wage orders were superseded by other interim wage orders

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or later amendments. As might be expected, more confusion resulted.

On Oct. 1, 2000, the Labor Commissioner implemented permanent regulations in the form of the Wage Order 2000, which again amended the relevant provisions of the Labor Code. Wage Order 2000 is largely the regulation Davis intended in his act of July 1999, however some concessions were made to employer groups, including concessions in regard to the hotly debated alternate work schedule. On Jan. 1, 2001, Wage Order 2001 went into effect, making additional changes to the law. The alternate work schedule provided for in the 2001 Wage Order is different from all old schedules dental offices may have had.

Who the Overtime Law Applies To

Wage Order 2001 applies to all employers, regardless of size.3 That is, even if an office has just one employee, daily overtime must be paid on all hours worked over eight in a single work day or over 40 in a single work week.4 All steps for implementation of an alternate work schedule must be strictly followed. There are no different requirements or exceptions for small offices as there are with some other employment laws.

What the Overtime Law Requires

Wage Order 2001 requires the payment of overtime at 1 1/2 times the regular rate of pay to all non-exempt employees on all hours worked over eight in a single work day or over 40 in a single work week. A very limited exception allows the work day to be extended to 10 hours by the implementation of an alternate work schedule.5

Requirements of an Alternate Work Schedule Under Wage Order 2001

The alternate work schedule allows the payment of straight time for hours worked up to 10 in a single work day after the proper implementation of that schedule and reporting to the state of California.6

The drastic difference from previous alternate or flexible work schedules occurs when employees with 10-hour alternate schedules are requested to work less than 10 hours during a single work day. The new laws state that the employer must allow the employee to work all the hours on that employee's individual schedule and compensate the employee for that work at straight time or must pay overtime to that employee for all hours worked over eight in the work day.7 That is, the dentist must elect from the two choices described above in compensating their employees for work over eight hours in a single work day.8

As an example, if an employee is scheduled to work 10 hours in a single work day and the dentist asks that employee to go home after 8 1/2 hours, the dentist would have the option of paying the 10 hours of straight time (that is, the 10 hours on that employee's work schedule) or paying the employee straight time for eight hours and 1/2 hour of overtime compensation at 1 1/2 times the employee's regular rate of pay. Dentists should be aware that they must select one of the options. Again, this is different from previous alternate or flexible work schedules.

For dentists whose work schedules are regular and planned, a properly implemented alternate work schedule can provide substantial financial relief from the daily overtime requirement. But for many offices, the alternate work schedule is no longer a practical solution and overtime hours should be minimized and paid as required.

How to Implement An Alternate Work Schedule

In the event a dentist determines it is in the practice's best financial interest to implement an alternate work schedule under the new laws, he or she must determine whether it is advantageous to have all the affected employees vote on the alternate work schedule or whether it would be better to separate the practice into job units. That is, dentists may elect to have their dental assistants on an alternate work schedule and their front desk personnel on a traditional work schedule. Front and back office job positions may be considered to be separate work units. One person may constitute an entire unit.

Once it has been determined which job positions would work best on an alternate work schedule, it must be determined which employees in these job positions would be affected by the implementation of an alternate work schedule. Only affected employees are eligible to vote.9 An employee whose job is unaffected by the overtime requirements will not be eligible to vote. For example, part-time employees are usually not affected, nor are any employees who routinely work less than eight hours in a work day.

Next, the dentist must hold a disclosure meeting for affected employees and provide them with written information as to how the alternate work schedule would apply to them and affect their compensation. No day on an employee's work schedule may be less than four hours.10 This must be done at least 14 days before the employees will be asked to vote by secret ballot.11 Each employee must be provided with his or her own personal alternate work schedule, or a menu of schedules, from which the employee may choose.12 This disclosure meeting must be called for the specific and only purpose of discussing the effects of implementing an alternate work schedule.13 No other business may be discussed.

Employees should be told they will be asked to vote in about two weeks on whether to implement the alternate work schedule. Employees must clearly understand exactly what their new schedule will be and what their schedule will mean to them in terms of their compensation. Dentists should let employees know that they are willing to discuss any questions during the period prior to the vote.

On the voting day, a brief meeting should be held to review the meaning of the

alternate work schedule. Then, employees should be asked to vote secretly as to whether to implement the alternate work schedule.14 Balloting must be anonymous. No specific format must be used.

In the event that at least a two-thirds majority vote is obtained in each work unit or in the entire office, the schedule has been approved.15 Each affected employee must then sign a written statement indicating agreement with the schedule. An alternate work schedule is now legally in place.

Labor Code section 511(e) then requires the employer to report the result of the balloting to the California Division of Labor Statistics and Research within 30 days of the balloting. To comply with this requirement, the dentist must send to the state, on his or her letterhead, the following information:

- The dentist's name;
- The date of the balloting;
- The results of the balloting; and
- The number of employees in the practice.

This information must be mailed return receipt to: State of California, Division of Labor Statistics and Research, P.O. Box 420603, San Francisco, CA 94142-0603.

Other Requirements Under Wage Order 2001 Alternate Work Schedule

There are numerous other requirements under the alternate work schedule that may affect some offices. For example: An employer must provide all of the above-mentioned disclosures in non-English language(s) if more than five percent of the staff speak primarily that non-English language. An employer must also reasonably accommodate an employee's religious beliefs and request not to work an alternate schedule when formulating that employee's individual work schedule.16 Note that a dentist may not punish or threaten to punish an employee in any way for failing to adopt an alternate work schedule or appeal an alternate work schedule.17

"Comp time" off is once again allowed under the Wage Order 2000 alternate work schedule. The requirements for use are strict but sometimes practical for the dental office. First, the employee must make a written, signed request to take time off for personal obligations and request to make that time up.18 Every request for such time off must be in writing.19 The time must be made up in the same work week and the hours worked on the make-up day must not exceed 11.20 The dentist employer may not encourage or solicit an employee to utilize comp time to meet the practice's schedule or for any other reason.21

The Grandfather Clause

The 2000 Wage Orders contain a grandfather provision that allowed employers that had legally adopted an alternate work schedule prior to 1998 to continue working that schedule if: 1) The employer has the secret ballots, the individual signed and dated disclosure statements, and the individual signed and dated agreement to work the alternate work schedule in their possession, regardless, it seems, whether or not any of the same employees are still in the dentist's employ and, 2) the employer reported the election, the date of the election, the final tally of the vote, the total number of affected employees, and the nature of the employer's business to the Division of Labor Statistics and Research before Jan. 1, 2001.

Failure to Comply

Employers that knowingly or unknowingly deny their employees proper compensation, including proper payment of overtime, subject themselves to several different avenues of redress by employees. Federal law allows employees to sue for attorney's fees;22 sue for double the amount of the claim through liquidated damages;23 and sue for interest, penalties, and damages. California state law allows for a specific legal action for failure to properly pay.24 Employees may also sue under broader sections of California's Business and Professions Code for unlawful employment practices.25

Employers must not turn a blind eye to overtime worked, even though it may not be recorded by employees.26 All overtime worked must be compensated, regardless of whether the employee requests the compensation or records the time accurately. Doctors must enforce and monitor the proper keeping of time records, as required by law.27

Conclusion

This author believes that the alternate work schedule exception to the daily payment of overtime to employees is not feasible for use by most dental offices in its presently mandated form and that the schedule may be improperly utilized by many offices potentially subjecting the dentist-employer to substantial penalties.

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23. Ibid.
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27. Lab. Code §1174(d).

To request a printed copy of this article, please contact: Bette E. Robin, DDS, JD, 330 W. Badillo St., Covina, CA 91723 or at Betrobin@aol.com.

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Chronic-Pain Management — A Timely Opportunity

G. Davis Kloeffler, DDS, and Parker E. Mahan, DDS

ABSTRACT During the past decade, there has been an intense debate among pain management specialists in medicine over the appropriate use of medication. This controversy centers around pain control and appropriate narcotic dosage. Dentistry's role in treating chronic pain has become complex because of differing views on pain management protocols. The dental literature regarding chronic-pain management is limited, and dentistry has only a minimal role in pain management. It is time for dentistry to take a larger role in treating chronic pain. The effective use of medications is only one aspect of chronic-pain management. The success rate for managing intractable pain can be substantially improved if practitioners take advantage of early diagnosis, aggressive physiotherapy, and multiple sympathetic blocks, as well as other blocks and antidepressants. For dentists to take an active role in this arena, they need broader education in treatment regimens. Interdependence with physicians and cross-referral between these two professions may lead to more-favorable outcomes, including improved function and quality of life.

AUTHORS

G. Davis Kloeffler, DDS, is an assistant professor in the Department of Advanced Education in Prosthodontics at the Loma Linda University School of Dentistry. He is a past chairman of the Maxillofacial Prosthodontic Department at the University of California at Los Angeles. He is a fellow of the American and International Colleges of Dentists. His private practice in San Diego is limited to craniofacial pain and temporomandibular disorders.

Parker E. Mahan, DDS, taught at Emory University School of Dentistry for 16 years and at the University of Florida College of Dentistry for 21 years. For many years, Maham served as director of the Dental Occlusion and Facial Pain Center at the University of Florida. In 1992, the Pain Center was renamed the Parker E. Mahan Facial Pain Center in his honor.

The dental profession has become extremely effective in managing most forms of acute orofacial pain, but orofacial pain of a chronic pathologic nature is more problematic. To diagnose and manage such pain disorders effectively, the clinician must have a solid understanding of the processes underlying these disorders.1 Since pain is a subjective rather than objective experience, its character varies considerably among patients, making it one of the most difficult problems dentists and physicians face in everyday practice.

The Pain Experience

The history of the dental profession illustrates dentists' involvement in pain management. From the time that Horace Wells discovered the application of nitrous oxide as an anesthetic until the present, dentists have worked long and hard to diminish or eliminate patient pain.2

The pain experience consists of a number of elements: a noxious stimulus, neuropeptide modulation, and the patient's emotional state. Dentists have been taught a primitive, unimodal pain-perception model. An example is a person burning his or her finger on a stove. There are nerve pathways that run from the finger to the brain, initiating the pain experience and a

noxious flexion reflex. This is a simplified way of looking at pain. It is now understood that there are many factors that modulate neural transmission. Pain has a complex and circuitous path.3 The sensation of pain is triggered by signals from nerve endings at the injury site (nociceptors) that are then processed in a feedback loop between the spinal cord and the brain. For example, there are nerve endings in the finger that send pain signals up to "control centers" in the spinal cord, where they are processed before the messages are relayed to the brain. Pain-inhibiting signals are now recognized as well. The brain evaluates the importance of the information coming from the spinal cord and sends back signals causing the spinal cord to mute the body's response to the pain.4 This process of evaluation continues as long as the pain persists. The spinal cord acts as a kind of arbiter of signals coming from the injury site and the brain.

Acute Pain

Following Crue's classification of pain (based on the temporal factor of pain duration),5 acute pain can be considered the first classification of pain in dentistry. Acute pain is the most common form and is a simple somatic defense of a transient nature. By and large, acute pain is benign. It is typically associated with an injury or disease of rapid onset and produces sometimes severe symptoms over a short time.6 Pain of several days' duration may start as an acute abscess, for example. A dentist's primary job with regard to pain is to look for the noxious stimulus, i.e., the pathology, and eliminate it. With the techniques now available, that can usually be done efficiently and readily. A dentist can identify the tooth causing the pain, take a periapical film, find the abscess, and perform a root canal treatment or extraction or provide an antibiotic treatment; and the pain will be managed. Treatment focuses on eliminating the cause of the pain.

Subacute Pain

Subacute pain is pain that lasts a little longer, but less than two weeks, for which the patient does not or cannot immediately see a dentist. An example would be a fulminating cellulitis. The patient may think the pain will go away, so he or she lets it linger before finally having to make an emergency appointment. The basis of these pain complaints is the same as for acute pain. Again, dentists are experts at diagnosing and managing this type of pain.

Chronic Pain

For many years, chronic pain was defined as pain that has lasted more than six months. This definition is no longer correct. Pain becomes chronic in nature when it continues beyond the expected duration of the initiating pathology.7 Pain patients can become chronic-pain patients two months after onset. Chronic pain begins as acute pain that was not successfully treated.

Chronic pain is often triggered by acute events, such as surgery or traumatic injury. However, chronic pain is perpetuated by factors beyond the triggering event, including pathologic changes in the nervous system in response to the original trauma.8 The basis for the pain is not clearly understood, and multiple contributing factors are often considered. Chronic pain need not be miserable nor intractable. Older people often wake up with chronic aches and pains. However, when chronic pain becomes complicated, it becomes hard to control. It can adversely stimulate multiple areas of the nervous system.

Because of misconceptions about chemical dependency and addiction, dentists may be under- or overmedicating their pain patients. Dentists who treat chronic head, neck, and facial pain disorders need to understand and appreciate the difference between the addicted and the dependent chronic-pain patient. Nociceptive pain and neuropathic pain are separated by a neuroplasticity in the central nervous system that accompanies persistent pain. Pain disorders that have a constant input are more likely to develop symptoms of chronicity. Chronic or persistent pain is related to neuropathic pain resulting from central nervous system and peripheral nerve dysfunction.

The preceding observations do not indicate a lack of interest or concern by dentists because they have been well-trained in anesthesia and pain management for dental and surgical procedures. The pain management problems may begin when the clinical examination reveals no reason for the pain condition. These pains can be confusing since they arise from the neural structures themselves and may reveal no somatic tissue changes.

Neuropeptide modulation of pain is a very active field of research. There are new types of medications that affect the metabolism of these patients and can reduce pain. The emotional and psychological state of the patient becomes increasingly important as the pain becomes more and more chronic.

Many of these patients respond to tricyclic antidepressants. The one most frequently used and studied is Elavil (amitriptyline).9 The therapeutic window for analgesia with Elavil is from 10 mg to 75 mg per day. Frequently, patients from physicians' offices will be taking from 150 mg to 200 mg of amitriptyline a day for depression. They will have already lost the analgesic potency because they have gone beyond the therapeutic window.

Patients taking more than 75 mg per day lose the analgesic potency, and it frequently takes approximately 21 days before they experience the antidepressant effect. Elavil does not affect acute pain.10-12 Elavil also does not affect certain chronic pain states such as degenerative arthritis.

With regard to the use of antidepressants and other drugs to treat pain, it is extremely important that the clinician be prepared to recognize and effectively deal with toxicity, drug sensitivity, drug interactions, drug dependency, side effects, and possible complications.4,10 There is a potential for a serious adverse outcome if tricyclic antidepressants are combined with other

drugs, especially in patients with a history of cardiac disease.12 Ultram (tramadol) is another example of an antidepressant used for pain. It should be used with caution and in reduced dosage when administered to patients receiving central nervous system depressants such as alcohol, opioids, anesthetic agents, phenothiazines, tranquilizers, or sedative hypnotics.13

The prescribing doctor should know about the potentiation, synergism, dependence, and possibility of addiction of other medications. When more than one drug is administered, drug interactions can lead to unexpected and serious adverse effects. Responsibilities for the adverse effects rest on the prescribing doctors, and they cannot be ignored.14,15

Articles about the inadequate use of narcotics and synthetic narcotics in chronic-pain patients are beginning to appear in the lay literature.16 The day may not be far off when a general dentist or oral surgeon will be sued for pain and suffering for refusing to write a prescription for enough narcotics or synthetic narcotics. Although most pain specialists now endorse the use of long-term opioid therapy for selected patients with chronic nonmalignant pain, this issue remains controversial and will not be adequately resolved without a clear understanding of the risks associated with addiction.17,18 Dentists and physicians may become fearful of the Drug Enforcement Administration and be reluctant to write a prescription for a narcotic, even though it may be indicated.19

Chronic pain is distinctly different and more complex than acute pain and has no time limit. Chronic pain often has an insidious onset and serves no useful purpose. It may trigger multiple psychological problems. Feelings of helplessness and hopelessness can create an urge to do almost anything to stop pain and make some drug-dependent patients behave like addicts. Others are driven into seeking repeated operations, and many may submit to the mercies of anyone promising a cure.7

Pain patients can become depressed, disabled, or dependent on the pain regardless of the event that initiated the pain problem.20 For example, patients who have had TMJ surgery that did not relieve their pain typically have complex pain and may have had more than one or two bilateral TMJ surgeries. These chronic-pain patients are characterized by preoccupation with pain, loneliness, passivity, lack of insight, and inability to take care of their own needs.7 As indicated previously, they may become polysurgical addicts and may come to the dental office and simply want to be fixed. Often they will not accept any responsibility for their therapy.

Some of these patients may even be suicidal. It is essential for the health care practitioner to recognize a patient's depressed mood because extreme depression is the most common cause of suicide.21 Such patients may not be able manage the real or imagined stresses of life. Qualified mental health professionals may need to enter into the treatment process. The suicidal patient may be intent on either dying or trying to control treatment. The No. 1 indicator of serious suicidal ideation is a previous attempt. In these cases, the mental state may be worse than the pain. Eighty percent of successful suicide victims have made a previous attempt.

The Chemically Addicted Pain Patient

Loss of control is a major characteristic of all addictions; it is also a major characteristic of chronic-pain syndrome.

Addictionists have found that the patient needs to take back command and responsibility. Coming to terms with addictive disease is difficult for patients who face the cultural legacy of the stigma that addiction is a failure of will and moral character. It is challenging to take on a new paradigm.22

Some patients with chronic pain are able to cope with this continuous and unpleasant perception and live productive lives.23 Severely debilitated chronic-pain patients often need narcotic medication to manage their pain. Doctors who are aware of the addiction potential of their patients are hesitant to prescribe narcotics or psychotropic drugs, and this creates a dilemma for doctors who treat pain patients.

As a result of the phenomenon of conditioning and the advent of new medications, there are some notable changes in the way prescriptions should be written. Okeson14 said, "Narcotics are best administered on a regular time schedule rather than as needed (PRN) to minimize unnecessary periods that may require increased dosage with attendant overmedication and increased toxicity." Narcotic prescriptions should be written on a temporal rather than as-needed basis. For example, in the past, a prescription might be written for 30 mg codeine and 300 mg of acetaminophen with two tablets to be taken immediately and then one tablet every four hours as needed for pain. The patient would then wait until the pain returned before taking the next tablet and thus gets a reward because he or she took the medication. This cycle would tend to condition the patient to take medication. It is better to write the prescription on a temporal basis and tell the patient to take two tablets immediately and write down the time of day. Then, when the pain returns, the patient should write down the time and note how much time has elapsed since the first dose. The patient should then take the third tablet immediately. If it has been five hours, the patient should take the next tablet in four hours. After three days, the patient should wait until the pain begins again to take the next dose. The pain problem may resolve on the second or third day. This procedure is less likely to condition a patient to take narcotic medication.

It is, therefore, extremely important for the dentist to understand the problem of addiction. Dentists must understand that tolerance and dependence will develop in almost all patients given repeated doses of opioids to relieve pain. However, dependency should not be confused with addiction. Addictive behavior is characterized by preoccupation with

drug use, loss of control, euphoria, and deterioration of values. The acquisition of drugs becomes more important than harmonious relationships, integrity, or interpersonal responsibility.

When prescribing medications, the dentist should watch for tolerance, physical dependence, and/or addiction, which involves psychological dependence. Tolerance means that larger doses are required to obtain a satisfactory analgesic effect. Physical dependency means that withdrawal symptoms accompany abstinence. Addiction means the patient has developed a compulsive craving for the drug and the need to use it for effects other than pain relief.

One subset of the chronic chemically dependent pain population are individuals who manifest a physical dependence and meet the diagnostic criteria for both an addictive disorder and a pain disorder. The addiction typically includes use of prescription medication -- such as opioids, steroids, and sedative/hypnotics -- but can also include over-the-counter aids, commonly used street drugs such as marijuana and amphetamines, and alcohol. Chemically addicted chronic-pain patients medicate not only the physical pain but also any psychological discomfort that magnifies the pain experience. The addictive use of pain-relieving medication increases drug tolerance and lowers pain thresholds.14 Such a patient may be dangerous to him- or herself and people in the medical-dental community. He or she may be in a self-defeating, destructive, cyclical pattern, leading to personal despair, occupational impairment, with frustration and anger developing within both the patient and the dentist. After once receiving medications for dental pain, these patients may then demand the next medication. If they do not receive it, they may threaten violence. This can happen in the doctor's office or the pharmacy.

In cases involving addiction, it is necessary to clearly assess and treat the underlying pain. However, the addictive disorder should be treated concurrently. Referral to an addictionist for the concurrent management of addiction and pain is highly advisable. Addictive disease is a chronic relapsing condition, as pain often is. These conditions may be disabling even in the absence of clear physical impairment. Both chronic-pain patients and individuals with addictive diseases often are exceptionally challenging to the doctor, and both types of patients have difficulty finding compassionate and effective dental care. To be successful in the treatment of both conditions requires a cooperative role on the part of these patients. It is well for the physicians and dentists treating these patients to remember that 12-step Alcoholics Anonymous and Narcotics Anonymous model programs have been effectively used in the treatment of chemically dependent pain patients.

Conclusion

Since medical specialists often feel unqualified to diagnose and treat head, neck, and facial pain complaints, more and more chronic-pain patients are referred to facial pain centers, TMD centers, or dentists who deal with TMD and orofacial pain patients.

If, indeed, head, neck and facial pain represent a large portion of the total chronic pain problem, then dentistry has an opportunity to help control pain complaints. This opportunity in pain management in the dental office should stimulate dental schools and all dental educators to provide advanced education in the newer concepts in pain management.

If dental practitioners go to the heart of the problem and focus their efforts on providing pain relief for chronic-pain patients, they can avoid political discourse and specialty narcissism. They can do this by training their own members about chronic-pain treatment as well as chemical dependency and addiction. In this way, dentists will increase their knowledge base and their ability to provide effective, compassionate care for chronic-pain patients.

Finally, there seems to be a new interdependence between physicians and dentists regarding chronic pain. This cross-referral between professions may lead to more-positive outcomes in chronic-pain management.

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To request a printed copy of this article, please contact/G. Davis Kloeffler, DDS, 10715 Tierrasanta Blvd., Suite F, San Diego, CA 92124 or at kloeffler@juno.com.

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Dental History Chiseled in Stone

Robert E. Horseman, DDS

This month we are honoring the memory of the late Lamar Wedelstaedt (1846-1919), former Herr Direcktor of the Dental Division of the Krupp Werke, GmbH. If everyone would please glove up and carefully withdraw the Wedelstaedt chisel of his choice from a sterile packet and raise it ... Excuse me? You don't have a Wedelstaedt chisel? Not one? Well, although a poor second choice, I suppose an enamel hatchet will do or perhaps a 6 1/2 x 2 1/2 x 9 hoe. What! None of those either? A gingival third margin trimmer then? No? How old are you, anyway?

I'm not surprised. These young dentists today -- give them an air abrasion unit and a $40,000 laser and they think they're doing operative dentistry. G.V. Black -- may he rest in peace -- must be spinning in his resting place. If he were alive today, discovering that his sacred concept of "extension for prevention" was now a reference to automobile bumpers and roll bars would kill him.

Approximately 72,000 hours of my life during the period from 1939 to 1943 were spent absorbing absolutes promulgated by the Operative Department at school. These were the same commandments dictated to Dr. Black atop Mt. Sinai. Engraved in stone, these dictates, I believed, would last forever, but the granite turned to clay. Only the guilt remains. What is a Class II cavity prep without extension for prevention? A major hang-up is what. Proving that you may be able to teach an old dog new tricks, but you can't make him forget the old ones.

But 72,000 hours wasted! I could have been researching interpersonal relationships with the opposite sex, honing my pickup lines or converting old wheelchairs into dune buggies -- the lost opportunities are endless

So I suppose there's no point in laying on a big retrospective honoring old Wedelstaedt any more than for the guy who invented the buggy whip or the gas-powered nasal hair trimmer. The transitory nature of dentistry is only a reflection of all other facets of life except Death and Taxes. Maybe Black and Weber and S.S. White and the dentist who pounded the last gold foil can do lunch with Wedelstaedt over a flagon of Bombay gin in some celestial watering hole and commiserate about the state of the art.

As for me, old Hugh Friedy and I are double-dating with the Scaler twins, Gracey and Jacquette at the Zeza Bar and Drill. Over chipped beef on toast, we're going to discuss the conversion of their outmoded facilities to the promotion of a Tooth-of-the-Month Club.

Briefly, each month for 28 months, we will send members a brand new, individually crafted, porcelain replica of a real

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tooth. Upon completion of their collection, they will receive at no extra cost, a bonus set of false gums that are virtually undetectable except under fluorescent light or vigorous probing. We feel that this offer should appeal especially to those who recently purchased the Final Answer OTC Aqua Regia/87% Carbamide Peroxide Kit at Pick'n Sav.

In the meanwhile, should any of you old-timers start to wax sentimental over yesterday's armamentaria, you can check out the chisels, hatchets, hoes and the rest over at your local True Value hardware store. They probably have replacement pulley wheels for your Doriot handpiece and a nifty selection of half-circle green-and-black rubber mats too.