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Robert L. Merin, DDS, MS
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March Came in Like a Lion ...

Jack F. Conley, DDS

This play on a familiar refrain is symbolic of a rather turbulent month for organized dentistry, a month that is only slightly beyond two-thirds completed as this is written. To be candid, the significant happenings in the world of dentistry in March 2002 demonstrated more vividly than ever before the importance of organized dentistry to its members.

For years, organized dentistry has stressed the benefits of membership such as educational opportunities through continuing education, including ADA and CDA Scientific Sessions; access to business and personal insurance programs designed for the dental practitioner; publications; peer review; legislative representation; and the list goes on. We recall that at one time a number of years ago, a list of CDA member benefits totaled 31. The happenings in March vividly illustrate the emergence of a very different kind of membership benefit.

The year 2001 provided notice that the 21st century would be furnishing the organized profession increased opportunities to defend the science upon which dental practice is based. As reported previously, two legal matters facing the California Dental Association and its members commenced in the early months of 2001 and are still active at the time this is written. We refer to the Proposition 65 matter and the suit against both the American Dental Association and CDA regarding mercury in dental amalgam.

The year 2001 also signaled a new attitude at the American Dental Association with the filing of a legal challenge against Aetna Insurance Company in August. Many colleagues found this pursuit of principle a refreshing change.

But the month of March 2002 would place a new importance on membership in organized dentistry. The chronology of events reads like this:

- March 6 -- The American Dental Association announced that a suit had been filed against WellPoint and its Blue Cross subsidiary alleging unlawful interference in the dentist-patient relationship.
- March 15-19 -- Two legal actions against CDA and its component societies alleging misrepresentation of the peer review system were filed. During this five-day period, CDA and 20 of the 32 component societies were served in this matter.
- March 20 -- A lawsuit was filed in California Superior Court against ADA, CDA, and "more than 20 corporations that deal in materials used to produce amalgam." The suit alleges that mercury in a mother's dental fillings caused autism in her 6-year-old son.

Obviously, the circumstances in organized dentistry's action against WellPoint and the suits against the profession are quite different. The ADA suit pursues a matter of principle that

dentists believe insurance companies have been abusing for many years. Many colleagues have been urging their professional organizations to be proactive against the business practices of insurance companies perceived to be unfair. In the past year, ADA has asked members to forward information and evidence demonstrating some of these unfair practices so that an appropriate response from the profession could be developed. It is too early to predict what outcomes will be achieved, but the suit does illustrate the value of organizational activity to pursue decisions on issues that would be impossible for the individual practitioner to address.

The suits against organized dentistry over amalgam and peer review represent the continuation of a different, but extremely serious, trend that surfaced last year. At first glance, these suits have the feel of an assault on organizations perceived to have "deep pockets." We doubt that it is any accident that the case alleging that a child's autism resulted from the mother's dental amalgams names ADA, CDA, and 20 corporations, accusing them of fraud, negligence, and illegal and deceptive business practices. And the case involves a legal firm active in the 2001 cases, a fact that strengthens our suspicions about the monetary motivation for the filing of this case.

The suits involving the peer review process, while quite different in purpose, cite CDA and all 32 component societies in a class-action lawsuit that occurred in the jurisdiction of only one society. These suits also appear to have a "deep pockets" motive.

Earlier, we commented that these events illustrated the importance of organized dentistry to its members. Whether proactive efforts, or defense on behalf of individual dentists, these activities reflect a new type of membership benefit. It is a membership benefit that potentially is more important to protecting the business interests of member dentists than any more-traditional member benefit.

In reviewing these pending legal matters, it must be remembered that individual dentists could be targeted by such actions and accused of negligence and fraud for utilizing what has been a well-accepted dental restorative or procedure when a patient in their practice has a medical problem that can be linked (even if remotely) to either the materials or to the procedure. Therefore, what is important to the dental profession in the current case is that it be won on the basis of science, and that it sets a precedent that will discourage future attacks on practicing professionals, either individually or collectively.

The peer review matter alleges among other things that misrepresentations by organized dentistry forces patients to undertake peer review for their complaints in lieu of filing malpractice actions against dentists. The outcome of this suit will be extremely important to members because it will reinforce the value of membership if defended successfully, yet could increase the likelihood of frivolous future liability actions against dentists if the defense is unsuccessful.

The bottom line is that in the practice environment of today, legal activity by our professional organizations -- whether proactive or in defense of the materials, procedures, or systems that we utilize to conduct or support our business -- is a most important form of membership benefit. It should be considered a major reason for dentists to join or to retain their membership in organized dentistry.

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Tobacco Companies Still Targeting Teens

By Collette Knittel

Graphic images of bloody gums, somber black ads, and smokeless Hollywood movies are some of the remedies proposed by government agencies and health groups to help stomp out smoking, especially among teens. New evidence points to the fact that -- despite the $200 billion-plus legal settlement with the states and promises to the contrary -- the tobacco industry is still targeting teens in its advertising and promotions.

According to a recent study conducted by the Centers for Disease Control and Prevention in conjunction with the Robert Wood Johnson Foundation, teenagers continue to be exposed to high levels of tobacco promotion in retail stores despite restrictions imposed on advertising. The report concluded that gas station and convenience stores, where 75 percent of teenagers shop once a week or more, were most likely to have "tobacco-friendly" environments where patrons would be frequently exposed to tobacco advertising and promotions.

"This study shows that tobacco advertising in retail stores is much more visible to our youth than tobacco health warning information," said Rosmarie Henson, head of the CDC's smoking and health program.

The study, which evaluated marketing trends in retail outlets where tobacco products are sold in 163 communities, also reported that tobacco marketing expenditures increased from $6.7 billion in 1998 to $8.2 billion in 1999. In the stores surveyed, self-service cigarette pack placement was observed in 36.4 percent, and multipack discounts were present in 25.2 percent. More than 68 percent of stores had at least one tobacco-branded functional object such as shopping baskets or counter change mats. In comparison, only 4.1 percent of the stores posted tobacco health warning signs.

"The pervasiveness of tobacco advertising in retail stores is weakening efforts to prevent adolescent smoking," said Jeffrey Koplan, MD, director of the CDC. "Directly or indirectly, this highly visible advertising is encouraging a new generation of children to take up a deadly habit."

In response to recent studies, the U.S. Justice Department has presented the tobacco industry with documents listing remedies that would restrict the marketing and sale of cigarettes, according to a March 11 Wall Street Journal report. These remedies, largely targeting minors' access to cigarettes, call for a complete ban on cigarette vending machines and the removal of the words "light," "low-tar," or "mild," on cigarette labels. All cigarette advertising would be limited to black-and-white print ads, and 50 percent of these ads would contain "graphic health warnings." In reforms that would affect retailers, the government will try to end trade promotions and giveaways, and seek to end "slotting fees" paid to retailers for favorable placement of tobacco products in stores, the Journal said.

Canada has already taken the idea of graphic or shock advertising to heart. The Canadian Dental Association and other concerned health organizations have lobbied government though the "Tobacco or Kids" campaign to adopt new warning labels on cigarette packages featuring a number of disturbing full-color photographs of the effects of smoking. One of the most shocking images is of a mouth with filthy blackened teeth and the warning "cigarettes cause mouth

diseases."

"Major health effects like lung cancer and heart disease are very serious; but, particularly with young people, they may seem a long way off," said Burton Conrod, DDS, immediate past president of the Canadian Dental Association. "These images show the immediate effects of tobacco like ugly yellow stains on teeth, gum disease, and bad breath, which directly contradict the glamorous image of smoking and should make an impact on new smokers."

Some antismoking groups are even honing in on Hollywood, asking the Motion Picture Association of America to place stiffer ratings on movies that portray smoking in a positive light. A study released in 2001 from Dartmouth Medical School found that tobacco use was featured in nearly 85 percent of the top 25 highest-grossing movies each year from 1988 through 1997. The MPAA considers violence, nudity, theme, language, sensuality, drug abuse, and other elements when assigning a film rating, according to its Web site.

In an effort to highlight tobacco-free role models for young people, the CDC, World Health Organization, and International Olympic Committee continued their Tobacco-Free Sports public education campaign at this winter's Olympic and Paralympic games in Utah. The campaign included television public service announcements and posters featuring U.S. Olympians and Paralympians endorsing a smoke-free lifestyle.

"These new education materials are wonderful resources because we recognize that athletes are among the most admired role models for young people, who emulate the behaviors they witness in their heroes," Koplan said.

Although some of these proposals seem vague and their effectiveness hard to quantify, the reaffirmed commitment by the U.S. government to proceed with its legal battle against the tobacco industry will have a definitive outcome, if slow in coming. The Justice Department's lawsuit, which alleges fraud, racketeering, and conspiracy by the major tobacco companies to conceal health risks of an addictive and deadly product, will begin in June 2003 before U.S. District Judge Gladys Kessler.

USC Working to Develop Virtual Reality Patients

In the craniofacial dentistry of the future, surgeons in training may experience the feeling of slicing through human tissue and bone before ever laying hands on a patient or cadaver.

Dentists may rely on detailed, multilayered 3-D models to give them precise anatomical information and help them determine the best treatment, while parents of children born with cleft palates or other facial anomalies may be shown precisely how their child will look after corrective surgery.

While these capabilities are still years away, researchers at the Craniofacial Virtual Reality Laboratory at the University of Southern California School of Dentistry are diligently assembling the technological pieces that will bring them to reality.

The school already has the tools to create 3-D images of a person's face and mouth and can track the motion of the jaw as never before. The challenge is to bring these individual technologies together to create a virtual craniofacial patient, the 21st-century version of a crash-test dummy.

"What we want to produce here is a realistic and accurate model of a patient," said James Mah, DDS, director of the laboratory and an assistant professor in the department of orthodontics. Mah is working with researchers from the School of Dentistry, Keck School of Medicine, and the School of Engineering.

The field of craniofacial dentistry has remained surprisingly untouched by technological advances, Mah said.

Using the virtual craniofacial patient -- complete with a 3-D head and neck -- surgeons could explore different treatments, predict outcomes and explain procedures to real patients. With the help of a special "head-mounted display," computed tomography and magnetic resonance images could be superimposed on a patient.

"It offers the surgeon X-ray vision to see through the patient, to see exactly where the bones, the vessels and the nerves are," Mah said. "That is a new technology that is very much in development. This is the future direction of this project."

Discontinuing Hormone Replacement Does Not Accelerate Bone Loss

Women who stop hormone replacement therapy lose bone at a rate similar to that of women who never took hormones, and longer-term hormone therapy does not appear to increase bone mineral density beyond the first three years of treatment, according to an article in the March 25 issue of the Archives of Internal Medicine.

Gail A. Greendale, MD, from the University of California at Los Angeles School of Medicine; Mark Espeland, PhD, of Wake Forest School of Medicine, Winston-Salem, N.C.; and colleagues measured the bone density of 495 women who participated in the three-

year postmenopausal estrogen/progestin interventions randomized controlled trial and had bone density measured again approximately four years after the trial's conclusion to evaluate hormone therapy's association with density.

The researchers evaluated whether women lose density after hormone therapy is discontinued; the rate of bone density loss for women who stopped therapy compared to the rate of loss for women not receiving therapy; and the association between long-term hormone replacement therapy and continued bone mineral density gains.

"Women who stopped therapy after one year during the trial had annual rates of density change of -0.54 percent (hip) and -0.81 percent (spine) during the following two years," wrote the researchers. "Those who underwent therapy for three years during the trial and then discontinued it had annual changes of -1.01 percent (hip) and -1.04 percent (spine)."

"Rates of density loss among women who stopped therapy during or after the trials did not differ significantly from those of women who did not undergo therapy, who lost bone at a rate of approximately 1 percent yearly during the first year of the trial and about half that rate afterward," the authors stated. "Women who continued therapy after the trial did not show additional density gains."

According to background information in the article, a variety of long-term benefits may be associated with postmenopausal hormone replacement therapy, including primary prevention of osteoporosis, primary heart disease, and other chronic diseases. One concern is that long-term use of hormone therapy (especially long-term estrogen use) may increase the risk of breast cancer, although results of studies examining this issue have had mixed outcomes.

"In summary, hormone replacement therapy for approximately seven years did not provide further bone mineral density benefit beyond that accrued at three years. Stopping therapy did not lead to an accelerated rate of density decline. The latter findings argue against accelerated bone loss as an explanation for the lack of hip fracture protection afforded by former hormone therapy use. From a clinical perspective, our results suggest that women who stop hormone therapy may resume bone loss, but that it will not be at a very rapid rate," the authors concluded.

Study Finds More Evidence Against Tongue Piercing

A new study published in the March Journal of Periodontology found that extended wear of barbell-type tongue jewelry could increase the chance of gum recession and tooth chipping.

Researchers from Loma Linda University School of Dentistry and Ohio State University College of Dentistry examined and surveyed 52 young adults with pierced tongues. They found gum recession in 35 percent of subjects with pierced tongues for four or more years, and in 50 percent wearing long-stemmed barbells for two or more years.

"During tongue movement, long-stem barbells are more likely to reach and damage the gums than short barbells," said Dimitris Tatakis, DDS, PhD, professor of periodontology at the Ohio State University College of Dentistry and co-author of the study. "Over time, this damage may cause the gums to recede, which can lead to more serious dental/oral complications."

Additionally, 47 percent of young adults wearing either type of barbell for four or more years had chipped teeth. The prevalence of tooth chipping was significantly greater in those wearing short-stemmed barbells (1/4 inch to 5/8 inch) for four or more years.

Researchers believe tooth chipping is a result of habitual biting of the barbell.

"A short barbell is possibly easier to position between teeth, which could be one reason why we are seeing more chipped teeth in this group," Tatakis said. "Another factor that was not investigated could be the size or material of the screw caps attached to the barbell."

Scholarships Increased for Students Who Work in Underserved Areas

The National Health Service Corps will offer a record $89.4 million in scholarship and loan repayments to dentists and other health professions who serve in rural and inner-city areas that lack adequate access to care.

"We are looking for the best and brightest to work where they can turn people's lives around and provide health care to people not used to getting it," said Health and Human Services Secretary Tommy G. Thompson. "Many students go into medicine hoping to improve the lives of the poor and the uninsured, but graduate with too much debt to pursue such a calling. The National Health Service Corps makes it possible for hundreds of young doctors and clinicians."

The increased resources -- almost $19 million more than last year -- will support 900 new and continuing loan repayment awards and 400 new and continuing scholarship awards. Awardees must agree to provide health care services for a minimum of two to four years in areas of the country with the greatest shortage of health care professionals.

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Administered by the Health Resources and Services Administration, the National Health Service Corps represents a key part of the strategy to expand access to health care services to those most in need -- especially those in rural and inner-city communities. Nearly half of the Corps' clinicians practice in government-supported community health centers, which provide health care to people regardless of their ability to pay and target services in areas where people face financial and social barriers to accessing high-quality care.

The loan repayment program is open to a long list of health care professionals, among them dentists, physicians, and nurses. The scholarship program is open to students enrolled or accepted for enrollment in accredited dental schools, medical schools, family nurse practitioner programs, certified nurse-midwifery programs, and physician assistant programs.

- More information on the Corps and the award application process can be found at the National Health Service Corps Web site at www.http://bhpr.hrsa.gov/nhsc/. Applications are also available by calling (800) 221-9393.

Genetic Disease Information Center Launched

The National Human Genome Research Institute and the National Institutes of Health's Office of Rare Diseases have launched a new information center that delivers free and immediate access to information specialists who can provide accurate, reliable information about genetic and rare diseases to patients and their families.

There are more than 6,000 genetic and rare diseases afflicting more than 25 million Americans, but many of these illnesses affect relatively few individuals. As a result, information about these rare disorders may be limited or difficult to find. The new service, called the Genetic and Rare Diseases Information Center, will help relieve this problem by providing reliable information about individual disorders.

Opened in February 2002, the center provides experienced information specialists to personally answer questions from patients and family members on the phone, as well as by e-mail, fax, and regular mail.

"I am delighted we can provide a resource that should be of great benefit to individuals with genetic and rare diseases, and their families," said Francis Collins, MD, PhD, director of the research institute. "Valid and accessible information about these conditions is hard to find, and having an information center staffed by professionals will fill a critically important need. The National Human Genome Research Institute is delighted to be partnering with the Office of Rare Diseases to establish this center."

"Now people can talk to someone – personally – and get information right away," said Henrietta Hyatt-Knorr, the office's acting director. "There will be a quick turn around. If you just received a diagnosis for yourself, your spouse, or your child, now you won't have to wait to find useful information."

The Genetic Alliance, an international coalition of more than 300 lay advocacy organizations and health professionals, staffs the center with information specialists. The center provides callers with authoritative information about specific illnesses from existing public domain sources, including reliable Web sites, brochures, articles, and even chapters from books. Experts at the information center ensure that the information sent out is current and accurate. The center, however, does not provide genetic counseling and does not offer diagnostic testing, referrals, medical treatment, or advice.

Contact information for the center is as follows:

- Telephone, answered Monday through Friday, noon to 6 p.m., Eastern time: voice (888) 205-2311; TTY (888) 205-3223
- E-mail: gardinfo@nih.gov
- Fax: (202) 966-5689
- Mail: Genetic and Rare Disease Information Center, P.O. Box 8126, Gaithersburg, MD 20898-8126.

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Patients, Pockets and Pathogens II: Demographics and Therapeutic Choices

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Dental technology is moving forward with increasing momentum. General dentists are at the hub of the wheel of dentistry and need to have a good understanding of periodontal therapeutic options so that they can properly treat their patients. They also need to know when to reach out for a periodontal specialist to extend their ability to provide optimum treatment.

The April issue of the CDA Journal on periodontics contained articles on host modulation, antimicrobial therapy, and systemic health interactions with periodontal disease.

The articles in this May issue focus on demographics and techniques. The article on "Changing Issues and Demographics Affecting Periodontal and Implant Therapy" was originally intended to be the keynote article, but when the periodontal articles were divided into two journals, we believed it would fit better with the topics in this issue. After reading the final article in this issue, we suggest that you re-read our introduction (Page 282) in the April 2002 CDA Journal so that you can get our "spin" on using new technology.

An important goal of these issues was to provide thought-provoking controversy that will encourage further dialogue between general dentists and specialists. We hope these two issues will stimulate excitement for periodontal therapy and help you keep your practices moving forward with constantly better patient care.

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Changing Issues and Demographics Affecting Periodontal and Implant Therapy

Roger K. Rempfer, DMD

ABSTRACT While the U.S. population is growing dramatically, the number of practicing dentists is expected to decrease. In addition, people are keeping more teeth and keeping them longer, thus increasing the amount of dental care they require. These trends bode well for the viability and demand for professional dental services. Thoughtful planning, nurturing of professional relationships, and the use of sound business resources will enable practitioners to realize the financial and personal fulfillment these opportunities afford.

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While the U.S. population is growing dramatically, the number of practicing dentists is expected to decrease. In addition, people are keeping more teeth and keeping them longer, thus increasing the amount of dental care they require. These trends bode well for the viability and demand for professional dental services. Thoughtful planning, nurturing of professional relationships, and the use of sound business resources will enable practitioners to realize the financial and personal fulfillment these opportunities afford.

The 32.7 million population increase in the United States from 1990 to 2000 is the largest 10-year increase in U.S. history, taking the population from 248.7 million to 281.4 million.1 Every state showed an increase, with the West being the fastest-growing region. California showed the largest numerical increase of any state, 4.1 million people.1 Estimates of further growth based on 1994 projections show the 2025 population approaching 335 million people.2 Bureau of the Census data from 1998, however, suggest this estimate is too low.3 The Bureau of Census provides three sets of population projections -- highest series, middle series, and lowest series. The high and low series assume extremes in rates of birth, death, legal and illegal immigration. For the purposes of this paper, the middle series, or moderate assumptions, are used.

In the 2000 census, the median age (the age at which half the population is older and half younger) was 35.3 years, up from 32.9 in 1990. The increase reflects a 28 percent growth in the number of 35- to 64-year-olds. The most rapid increase of any group in the Census 2000 profile was the 45 to 54 age group, which showed a 49 percent jump. This increase to 37.7 million in 2000 was fueled mainly by baby boomers (those born from 1946 to 1964). The slower growth of the population group age 65 and older reflects the relatively low number of births in the late 1920s and early 1930s.4

Further changes in the older than 65 population will be reflected by increases in life expectancy. Census bureau data projects increases of two to five years for different racial population groups when

comparing data from 1999 and matching it against 2025 projections using middle series data.5

Trends Among Dental Practitioners

In 1990, the number of professionally active dentists in the United States reached a maximum of 59.5 per 100,000 population. The number of professionally active practitioners for that same period was 55 per 100,000. In 1976, the ratio was 51 dentists per 100,000 population with 46 of them per 100,000 population being professionally active practitioners. The ratios since 1990 have been in decline. ADA and the federal Health Resources and Services Administration suggest that this declining ratio will continue throughout the 2020 projection period. It is estimated that this ratio will fall to 53 professionally active dentists per 100,0006 or slightly less than the 1980 ratio. This translates to 48 professionally active practitioners per 100,000.7 It is further estimated by the American Dental Education Association that the number of professionally active dentists will begin to decline about 2014. At that juncture, the assumption is that 81,600 dentists will enter practice while 84,500 will leave.8 This trend is likely to cause modifications in practitioner retirement plans as fewer new dentists will be available to assume practices. Female dentists are a rapidly increasing segment of professionally active dentists. In 1982, female dentists made up 2.6 percent of active private practitioners.9 In 1997, this percentage increased to 12.8 percent.10 Female active private practitioners relative to the total number of active practitioners are estimated to increase to 18.7 percent in 2005, 22 percent in 2010, and 28.3 percent in 2020. As many female practitioners chose different career patterns in order to combine family responsibilities with professional responsibilities, the shortage in the dentist workforce may be further exacerbated.

Patient Trends

With oral health improving and people living longer, the number of teeth to be maintained is increasing at a rate faster than the population is growing. One does not have to look back far to find a generation of adults who believed it was inevitable to lose their teeth and wear dentures.10 A large segment of today's older adults have maintained a portion or most of their natural dentition. Indeed, 46.3 percent of adults age 70 or older have retained an average of 20.5 teeth.11 A large segment of baby boomers will be entering retirement about 2011 with nearly a full complement of teeth.12 In the period following World War II, children were taught that if they went to the dentist and had their teeth cleaned and filled they would keep them. To a very large degree this succeeded. In the late 1970s and early 1980s, children were taught that with proper home care, the use of fluorides, and the application of sealants, they would not have tooth decay. This succeeded as well.

Approximately 55 percent of children age 5 to 17 have had no tooth decay. In 1986-87 it was 50 percent. In 1979-80 it was 37 percent. About 25 percent of the children have 75 percent of the involved teeth.13 The decline in the number of edentulous adults has fallen dramatically from 14.7 to 7.7 percent between 1971 and 1994.13 In the 65 to 74 age group, edentulism fell from 45.6 to 28.6 percent.14 It is evident that the number of teeth that will be retained and require care will steadily increase. Compounding this further are the U.S. Bureau of Labor Statistics numbers that describe the civilian workforce retiring at a later age. It is estimated that the number of people in the workforce age 55 and older will increase from 17.1 million to 23 million by 2006.

Dental service expenditures have increased 70 percent since 1990. Estimates for 2000 place 56 percent of the U.S. population in dental benefit/insurance plans. Of these, 43 percent are enrolled in indemnity plans. Approximately 18 percent are in health maintenance organizations and 31 percent are in preferred provider organizations. Referral-type PPO programs make up 7.5 percent. Almost 31 percent of patients pay for care themselves, while 63 percent of patients are enrolled in some type of benefit plan.15 It is of significance to note that while more than half of dental plan enrollment is in PPOs and HMOs, only 50 percent of practicing dentists participate in them.

Disease Trends

With the retention of teeth for longer periods and in greater numbers, there comes a shift in dental disease patterns and treatment demands. It was thought in the 1980s that the progressive decline in dental caries, particularly in children, would produce significant changes in terms of treatment needs of the population and possibly a reduced demand for dental practitioners. Instead what has happened is the fulfillment of the counter argument that purported that the increasing retention and maintenance of teeth would create new needs and greater demand for treatment. There has been a progressive shift in severity of caries treatment in children to a greater need for care in the middle aged and older adult population. This trend, however, is not applicable to individuals with low socioeconomic status. Not surprisingly, periodontal disease has been found to be greater in individuals who have retained their teeth.16 By retaining greater numbers of teeth, adults experience greater severity of periodontal involvement.15 This translates into increased treatment needs and complexity of treatment with a growing population. It has been demonstrated that adults with 25 or more natural teeth also made twice as many dental treatment visits as those with 10 teeth.16

Trends in Services

It is understood that the issues that have been described will be significant factors in an increasing demand for periodontal and restorative services. What must also be considered are the specific demands consumers will place on these services as a result of the expectations of the baby boom generation and the growing affluence of dental consumers. Expectations have grown beyond the concept of oral health to having a cosmetically acceptable smile and comfortable functioning teeth. Dentists and patients alike are realizing that single-tooth implants are a more conservative approach to replacing missing teeth than are classic tooth preparations. To deliver on these demands, periodontists will have to invest, utilize, and leverage all the available hard and soft tissue reconstructive procedures to retain teeth, enhance cosmetics, and address the rapidly increasing patient demand for implants. Restorative practitioners will need to maximize their skills as well and will have to invest significantly in products and equipment that are rapidly changing and obsolete all too soon if they are to satisfy both consumer and competitive demands.

A random ADA survey of dentists regarding implants noted nearly a tripling in implant placement during a 10-year period. Periodontists were also noted as placing the largest number of implant fixtures, followed by oral surgeons.17 This same report described a small number of restorative dentists also placing implant fixtures. Considering the characteristc operational costs of restorative practice, adding the additional equipment, inventory, and training costs associated with a surgical implant placement produces concerns regarding a reasonable return on investment. Indeed, many periodontists and oral surgeons do not provide implant services for this same reason. Implant companies are seeking to exploit the restorative dentist market by encouraging them to surgically place implant fixtures. Their approach appears driven by their concerns to capture more market share in an already highly competitive manufacturer marketplace. It does not appear that manufacturers have fully considered or understand the cost and operational ramifications this creates for the nonsurgical practice. More importantly, because they use this approach, it appears that manufacturers do not understand the compromise it brings to the benefits of the shared risk relationships that have been enjoyed by the restorative/surgical team in dealing with compromised as well as successful cases. All disciplines of dentistry have benefited more by leveraging their relationships with each other as opposed succumbing to outside market entities who may offer only their proprietary agendas.

The issues of economy of scale for practice procedures will not disappear regardless of positive changes in demographics. It has been suggested that with current and projected demographic changes combined with the need for operational efficiencies, restorative practitioners will focus their practices on specific areas of emphasis.18 These will include practices limited to esthetic dentistry, geriatric dentistry, diagnostic services, group practices, and HMOs. There may also be opportunities for boutique (single doctor, small staff, fee for service only) practices if executed properly.

A tally of calls to the Academy of General Dentistry smile line during an August 2001 meeting, showed that baby boomers and consumers older than 65 topped the list of callers. Their top dental concerns were periodontal questions and tooth loss. Questions regarding cosmetics, implants, and dry mouth were also issues for this group.19

For 2000, the estimate of the number of dental implants placed in the United States was 910,000.20 This number is expected to increase with a compound annual growth rate of 18.6 percent through 2005. By comparison, the growth rate during the mid 1990s was 7 to 10 percent. AGD statistics suggest that to satisfy current implant needs, every U.S. dentist would need 20 appointments per month for the next 20 years to place and restore fixtures for the current level of missing teeth.21

The Collective Picture

The developing picture discussed is one of growing demand for periodontal and restorative services as a function of increasing scarcity created by:

- Growing population;
- Aging population;
- Progressing decrease in practitioner/population ratio;
- Retained dentitions;
- Increased longevity;
- Deferred retirement;
- Increased consumer sophistication; and
- Increased discretionary income.

Further compounding the issue of demand will be the impact of new technologies that will create new and better treatment options for consumers. Increased information dissemination via the Internet will also fuel demand as consumer awareness and understanding increases.

Successful practitioners will need to qualify and implement efficiencies in the delivery and business of patient care. They will also need to invest significant sums on an ongoing basis into technology and training for themselves as well as their staffs. Patient expectations on quality of service and care will only be increasing. Failure to address any of these may significantly impede practitioners' abilities to effectively meet patient demand, sustain market share, and remain profitable.

Conclusion

The information discussed here bodes well for the viability and demand for professional services. It is also positive in terms of improving the dental health of the public. What was not seen or

predicted a decade ago now creates a new paradigm for the profession. Thoughtful planning, nurturing of professional relationships, and the use of sound business resources will enable practitioners to realize the financial and personal fulfillment this opportunity affords.

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Therapeutic Choices in the Molar Region

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ABSTRACT Treatment of the damaged molar often presents a set of challenges unique to the posterior dentition. Traditional dental treatments continue to be refined to improve the prognosis when treating the posterior dentition. Daily treatment-planning decisions include whether to treat with conventional dental or implant therapeutic approaches, and involve consideration of local host factors as well as limitations in specific therapeutic approaches. This article will review some of the factors to consider in these treatment-planning decisions

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Treatment of the damaged molar often presents a set of challenges unique to the posterior dentition, given the presence of furcations, root proximities, and the maxillary sinus. Traditional dental treatments, including endodontic and periodontal treatment modalities, continue to be refined to improve the prognosis when treating the posterior dentition. Advances in surgical techniques, magnification, and materials to enhance healing responses are increasing the predictability of a positive outcome. At the same time, dental implant therapies are providing return of form, function, and esthetics to the patient with the damaged dentition. Daily treatment-planning decisions include whether to treat with conventional dental or implant therapeutic approaches, and involve consideration of local host factors as well as limitations in specific therapeutic approaches. This article will review some of the factors to consider in these treatment-planning decisions.

Clinical Crown-Lengthening Procedures

Restoration of a tooth exhibiting subgingival caries, fracture, or resorptive lesions may necessitate a combination of periodontal, endodontic, orthodontic, and restorative treatments. Clinical crown-lengthening surgery is often performed to expose the apical extent of caries or a fracture, or to place an area of cervical external root resorption above the marginal gingiva.

The concept of clinical crown lengthening is based in part on the findings of Gargiulo and colleagues in 1961.1 Human autopsy specimens were evaluated histologically to determine the dimensions of the periodontal structures associated with the natural dentition. Average measurements of 0.97 mm of epithelial attachment and 1.07 mm of connective tissue attachment to the root

surface were noted with a mean sulcus depth of 0.69 mm. While there were variations in all measurements, these mean measurements form the basis for the concept of the biologic width of attachment. Violation of this width of attachment apparatus by restorative treatment efforts can induce an inflammatory reaction with subsequent loss of crestal bone and connective tissue as well as migration apically of the epithelial attachment.2-4

Surgical clinical crown-lengthening procedures ideally establish a cavo-surface to crestal bone distance of 3 mm5 to 5 mm,6 and animal studies indicate that the biologic width of attachment is re-established with epithelial and connective tissue attachment to the root surface during the healing and tissue maturation process7 (Figures 1 through 5).

Surgical clinical crown-lengthening procedures do, however, remove supporting crestal bone. The anticipated remaining osseous support should be determined preoperatively as well as preoperative mobility patterns. Root forms play a role in this determination. Long, broad root forms with parallel walls generally have a better prognosis than short, conical roots. Furcation position on molar teeth in need of crown lengthening or on molar teeth adjacent to premolar teeth in need of crown lengthening procedures will also be a factor. In general, molars with moderate to long root trunk and divergent root forms (**Figure 6**) are more favorable candidates for these surgical procedures than are those teeth with short root trunks or convergent root patterns (**Figure 7**). Caries, fracture, or resorptive lesion proximity to a furcation opening can weigh negatively on the decision to attempt to retain the tooth in question. Surgical crown lengthening in molars with a short root trunk can lead to horizontal furcation involvement, downgrading the long-term prognosis for the tooth, particularly in periodontally sensitive individuals. Preoperative mobility patterns are also a consideration.

Table 1. Clinical Crown Lengthening

Factors for	Factors against
Caries or fracture greater than 2 mm from furcation entrance	Caries or fracture within 2 mm of furcation entrance
Lack of generalized recurrent caries activity	Generalized recurrent decay/xerostomia
Long, broad and divergent root forms	Short, conical and convergent root forms
Average to long root trunks	Short root trunks
Negotiable endodontic canals	Untreatable endodontic situation
No mobility	Existing mobility

Table 2. Furcation Classifications – Glickman

Grade I	Incipient
Grade II	Loss of interradicular bone and pocket
Grade III	formation, but not extending through to the opposite side
Grade IV	Through and through lesion
	Through and through lesion with gingival recession, leading to a clearly visible furcation area

Recurrent caries in the xerostomic patient may also increase the likelihood of intermediate or long-term failure (**Table 1**).

Clinical crown-lengthening procedures may also be indicated in the management of external resorptive lesions. Root resorption may be secondary to damage to the periodontal ligament through acute trauma or endodontic, orthodontic, pedodontic or periodontal procedures.8 Internal bleaching procedures of pulpless teeth may also be responsible for initiating a resorptive response, 9 however, these procedures are rarely performed in posterior teeth.

Furcation Management

Molar and premolar teeth exhibiting furcation involvement present some of the greatest challenges to successful dental treatment. Various classification schemes have been developed in an effort to describe the degree of involvement, with descriptions of grade or class based generally on the degree of horizontal furcation involvement. Glickman10 described four grades of furcation involvement (**Table 2**), with other classifications through time further defining his grade II lesion.11,12

The horizontal and vertical component of the furcally involved tooth will be one of the greatest determinants of successful professional instrumentation and surgical therapy, however additional contributing anatomic factors also play a role. Furcation entrance width, root trunk length and the presence of root concavities, cervical enamel projections, and enamel pearls have all been cited as prognostic indicators.13 The width of the furcation entrance was evaluated by Bower,14 with the majority of entrances measuring less than 0.75 mm. Difficulties are then encountered in thorough root preparation with hand instrumentation in these sites, as the average width of the curette blades is wider than this distance. The presence of cervical enamel projections and enamel pearls prevents connective tissue attachment to these areas15 and complicates the management

Figure 1. Provisional crown in place tooth #14 (buccal) with biologic width encroachment.

Figure 2. Postoperative view after crown lengthening.

Figure 3. Preoperative X-ray of molar with inadequate clinical crown length for restoration.

Figure 4. Photograph of the same case.

Figure 5. Osteoplasty and ostectomy have achieved a 3 mm cavo-surface to osseous crest distance.

Figure 6. Average root trunk length and root form at minimal risk for furcation involvement with clinical crown lengthening.

Figure 7. Short, conical convergent root form with short root trunk. High risk for postsurgical furcation involvement and postoperative mobility.

of the furcation lesion.

Endodontic and periodontal interrelationships also play a role in the management of the furcation region. Pulpal necrosis and lesions of endodontic origin often lead to destruction of the periapical alveolar bone, and if undiagnosed or untreated, can progress through the periodontal ligament and present as localized loss of clinical attachment. This commonly would present as a narrow, deep localized probing defect leading to the area of primary destruction. However, in long-standing endo-perio lesions and in cases of root proximity, they can present as broad deep pockets and extend in a tortuous course (Figures 8 through 10). The presence of accessory or furcation canals has been noted in from 23 percent 16 to 76 percent17 of molars studied, and studies have confirmed that pulpal inflammation will induce an inflammatory condition in the interradicular area.18,19 The pulpal status of the tooth needs to be diagnosed when there is furcation involvement, and endodontic therapy initiated if indicated. The furcation lesion will often repair, with successful endodontic therapy, if the damage is due to pulpal necrosis.

Surgical treatment of the furcation-involved molars has targeted increased access for home care and preventive maintenance visits (pocket elimination surgery, tunneling procedures, and root resection) or has been directed at efforts to regain lost clinical attachment through grafting materials, guided tissue procedures, or regenerative proteins. Many studies have been performed to evaluate efficacy of various treatment modalities. Wang studied the effects of various surgical approaches and noted that molars with furcation involvement were 2.5 times more likely to be lost during the eight-year study period.20

Many studies have evaluated the long-term effectiveness of root resection procedures in preserving the dentition. Langer and colleagues retrospectively evaluated the response of 100 patients to root resection procedures.21 Thirty-eight percent of the treated teeth were classified as failures during the 10-year observation period, due to bone loss, root fracture, untreatable caries, or

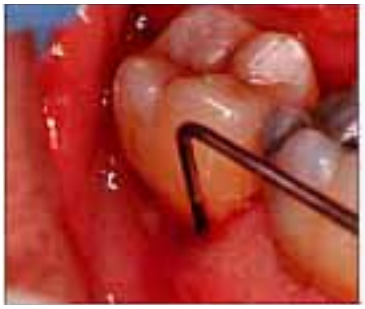

Figure 8. Apparent periodontal breakdown in the region of the buccal furcation tooth #31.

Figure 9. Gutta percha traces to the buccal furcation area on tooth #31. Note defective distal cervical restoration #31 and periapical radiolucency distal root #30. Vitality tests indicate tooth #30 non-vital and tooth #31 vital.

Figure 10. Furcation lesion tooth #31 has resolved with successful endodontic therapy on tooth #30. Overhand #31 has been recontoured.

Figure 11. Advanced periodontal involvement of the distal-buccal root of tooth #3.

Figure 12. Distal-buccal root resection and endodontic therapy has been completed on tooth #3.

Figure 13. Radiographic appearance of tooth #3 16 years after root removal.

Figure 14. Clinical appearance of tooth #3 16 years after root removal.

endodontic problems. Another 10-year study by Buhler revealed a 32 percent total failure rate in root resected molars.22 While other investigators report greater successes, a general review of the published results of the root resection studies indicates an average failure rate of 22 percent in those studies covering a period of at least 10 years and without extensive fixed splinting.23 The successes of this approach commonly were related to proper restoration design, appropriate periodontal therapy, and the successful endodontic treatment of the remaining root(s) (Figures 11 through 14).

Techniques aimed at regeneration of lost periodontal support include grafting with synthetic grafting materials, autografts, or allografts. Synthetic materials histologically have been shown to primarily become encapsulated in connective tissue and offer little in terms of regeneration of lost support.24,25 Autografts can be obtained from osseous coagulum at the time of surgery or from an intraoral or extraoral donor site. Allogenic bone grafts are available from tissue banks, generally as freeze-dried powders or particles. Evidence indicates that significant bone fill beyond that of debridement controls can be expected following bone grafts. Mean defect fill averages approximately 60 percent to 65 percent following use of these materials over several studies.26

Guided tissue regenerative procedures have also been widely used to aid in management of the furcation lesion after a series of compartmentalization studies by Melcher. 27 This treatment approach allows for selective cell repopulation of the root surface, which, in turn, determines the type of attachment that forms. Studies aimed at evaluating the response to guided tissue regeneration procedures reveal significant improvements, particularly in mandibular class II furcations, when compared to debridement alone. Improvements in clinical attachment levels generally occur in the vertical rather than the horizontal direction.28,29

Figure 15. Fractured mandibular first molar and missing second molar.

Figure 16. Missing molars replaced with two ITI implants. This radiograph is 14 months after implant loading (Implant prosthetics by David M. Campbell, DDS).

However, complete furcation closure does not generally occur. Results of long-term studies following guided tissues regeneration procedures suggest that the regenerated periodontium is stable over time in patients who are compliant with plaque control and maintenance intervals. Noncompliant patients, where unsatisfactory levels of gingival inflammation persist or reoccur, are at substantial risk for disease reoccurence.26

Dental Implant Treatment

Replacement of missing teeth through endosseous titanium dental implant fixtures is an increasingly popular treatment option. Benefits to this type of therapy include increased support for transmission of masticatory forces, absence of carious lesion formation, improved esthetics and predictability. The longest-term data regarding survival and outcomes of implant-retained prostheses deals with the fully edentulous situation, with 20- to 30-year data available. Shorter-term studies have examined success rates of replacing a missing molar tooth with an implant-supported crown restoration (Figures 15 and 16). Becker and Becker30 reported a 95.7 percent success rate with 24 molar implants placed in 22 patients, followed for an average of two years. Balshi 31 reported a similar success rate of 98.6 percent in 47 patients over a three-year evaluation period, and success rates of 96.3 percent were reported by Bahat and Handelsman32 with a mean loading period of 16 months.

Anatomical limitations play a role in abilities to replace missing molar teeth with implant-supported restorations. Sinus proximity, inferior alveolar nerve position, adjacent tooth roots and degree of buccal-lingual and occlusal-apical ridge resorption patterns define the available bony housing for implant fixture placement. There are many techniques to improve the volume of bone in deficient sites, including autogenous block grafts, particulate grafts with and without regenerative membranes, and biomodifiers and growth factors. The ability to successfully place a dental implant fixture in an ideal position for return of form and function often depends on the practitioner's ability to develop the implant site, either prior to or concurrent with implant fixture placement.

Conclusion

The molar area presents some of the greatest challenges to successful long-term therapy. Over time, many techniques to preserve the damaged molar have been developed that today appear heroic. The approach to this problem is often multifaceted, and the long-term successes are as dependant upon the ongoing periodontal maintenance and plaque control abilities of the patient as on the technical excellence of the therapy provided. The current successes with the single-molar implant-supported restoration look very promising, and this type of approach removes many of the previous determinants of success from the equation. Longer-term studies and patient follow-up will further define the extent to which the single molar implant-supported restoration replaces the more "traditional" therapies in the management of the damaged molar.

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The Immediate Dental Implant

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ABSTRACT Numerous clinical studies have shown that dental implants can be placed immediately in extraction sockets with success when sites are carefully selected. Dental implants have been placed at the time of extraction with a variety of techniques. All the techniques report survival rates of 94 percent to 100 percent over a varied healing period of three months to approximately seven years. This article will review clinical criteria for determining patient selection for immediate implants and the advantages and disadvantages of immediate implant placement.

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During the past 10 years, numerous clinical studies have shown that dental implants can be placed immediately in extraction sockets with success when sites are carefully selected. Dental implants have been placed at the time of extraction with a variety of techniques including without augmentation, with bone grafting, with bone grafting and a barrier membrane, and with and without primary closure. The techniques report survival rates of 94 percent to 100 percent over a varied healing period of three months to approximately seven years.1-7 Investigators have reported high success rates with all type of implants, including screw, cylinder, Hydroxylapatite-coated, tapered, and single-stage.

This article will review the important clinical criteria for determining patient selection for immediate implants and the advantages and disadvantages of immediate implant placement. It will also discuss the clinical steps for the placement of dental implants in extraction sockets. The single-tooth implant restoration has been the most common immediate implant application, but immediate implants have also been successfully utilized in full-arch restorations.8 Single-rooted teeth, predominately incisors and premolars, have been the most frequent sites for immediate implants; but a study by Schwartz-Arad and colleagues evaluated molar immediate implants and found a success rate similar to healed molar sites in carefully selected cases.9

Patient Evaluation

The first step in determining whether immediate implant placement is a reasonable clinical choice is evaluation of the potential implant site. Several classification systems have been proposed by a variety of authors, including Salamma, Gelb, and Becker.10-12 All the

Figure 1a. Preoperative radiograph of tooth #4.

Figure 1b. Immediately after ITI implant placement.

Figure 1c. Two and one-half years after placement. Note that tooth #3 has endodontic pathology (Implant prosthetics by James M. Herron, DDS, Woodland Hills, Calif.).

systems provide criteria for evaluating the bony morphology for immediate implant placement. The ideal extraction site for immediate implant placement is one where there is little or no periodontal bone loss on the tooth that is to be extracted, such as a tooth with endodontic involvement, root fracture, root resorption, periapical pathology, root perforation, or unfavorable crown to root ratio(not due to periodontal bone loss). In all studies, the investigators chose bony three to four walls and sufficient bone to stabilize the implant. Most researchers report desiring at least 3 to 5 mm of bone beyond the apex and a bony length of 10 mm or greater for immediate implant placement (**Figure 1**). There is general consensus that bony defects with two and three walls missing or severe labial and circumferential defects are not suitable for immediate implant placement. Wilson showed that the horizontal or circumferential component of the peri-implant defect was a critical factor relating to the final amount of histologic bone-implant contact, and that horizontal defects of less than 1.5 mm do not need membranes to obtain histologic osseointegration13 (**Figure 2**).

Therefore, immediate implant placement should be limited to those defects that have three- and four-walled sockets, minimal periodontal bone resorption, sufficient bone to stabilize the implant, and minimal circumferential defects. Initial implant stability is the most critical factor in implant osseointegration, therefore an ideal site is one with significant alveolar bone around the socket enabling the implant to fill the socket space (**Figure 3**). Ivanoff and colleagues have shown that early mobility of implants greatly reduces their integration and clinical success.14

Clinical Procedure

Tooth Extraction

The first step in immediate implant placement after case selection is an atraumatic extraction. Every attempt should be made to minimize trauma to the alveolus during the extraction. The use of a minisurgical blade to make the initial sulcular incision around the tooth will facilitate separating the soft tissues from the root and cutting the periodontal ligament. In many cases, the sulcular incision will be the only incision needed. The periodontal ligaments can be further separated from the tooth with a periotome, which will help prevent fracture of the alveolus (**Figure 4**). Once the tooth has been loosened with the periotome, if there is adequate tooth structure, the tooth can be carefully removed with extraction forceps. If there is not adequate tooth structure to grip with forceps or rongeurs, then the extraction may be attempted with the periotome alone or by sectioning the root so that the remaining root fragments can

Figure 2. Close adaptation of an implant to the crestal socket wall, within 1.5 mm.

be extracted without placing pressure on the alveolus. The socket is then debrided with curettes or rotary instruments. The resulting extraction socket is evaluated for osseous defects. If all four walls are intact and the circumferential defect is less than 1.5 mm, an implant well may be placed without the need for bone grafting or augmentation. If three or more walls are present or if the circumferential defect is greater than 1.5 mm, an implant may be placed; but bone grafting and protection of the socket with a membrane is recommended.

Implant Osteotomy

The next step is the preparation of the extraction area and the apical bone for the placement of the implant. The first step in the dental implant placement is the beginning of an osteotomy with a round bur or pilot drill. If the site is a maxillary anterior tooth, the osteotomy

Figure 3a. Preoperative view of tooth #25.

Figure 3b. ITI narrow neck implant immediately after placement.

Figure 3c. Six months after placement (Implant prosthetics by Gregory W. Holve, DDS, Valley Village, Calif.).

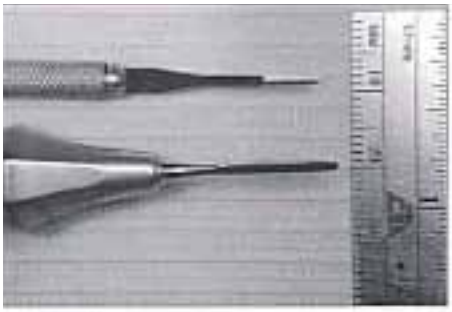


Figure 4. Microsurgical scalpel (top) and periotome (bottom) can be used to help extract teeth.

Figures 5a through f. Implants are placed in extraction sites and extraction defects. Note that implants are placed at palatal aspect of the sockets with no pressure on the buccal place.

Figure 5b

Figure 5c

Figure 5d

Figure 5e

Figure 5f

Figure 5g. The implants at uncovering

Figure 5h. The final restorations.

must be kept on the palatal aspect of the alveolus to prevent perforating the buccal plate. Once the osteotomy is complete to the desired depth with at least 3 to 5 mm of intimate implant to bone contact, an implant is placed. The implant must be stable within the osteotomy with no mobility. The implant may touch all of the bony walls of the extraction site but should not place undue pressure upon thin alveolar walls (**Figure 5**). Kohal and colleagues have shown that pressure of the implant on the bony walls of the alveolus can result in microfractures and early crestal bone loss.15 The ideal situation would be for the implant to be in contact with the socket without putting undue pressure on the socket walls unless the alveolus is very thick, leaving no gap between the occlusal part of the implant and surrounding socket walls (**Figure 5**). In other words, the postoperative radiographic appearance of an ideal immediate implant placement would look the same as a standard implant placement (**Figure 6**).

Figures 6a through d. No. 11 is fractured, and #10 has irreversible mobility due to traumatic injury, which prohibits the replacement of the fixed bridge #11-15.

Figure 6b

Figure 6c

Figure 6d

Figures 6e through g. Implants are placed in the extraction sites of #10 and #11 and in the #12 and #13 healed sites

Figure 6f

Figure 6g

The Implant to Socket Wall Space

The space between the implant and socket wall has been an issue of concern and controversy. Studies have shown that close adaptation of the implant to socket wall promotes greater osseointegration13,16 (**Figure 7**). Additionally, in areas where there is a wide space from the implant to socket wall, better bone healing is achieved when an occlusive membrane is placed over the socket. In clinical studies, investigators have utilized a wide variety of techniques -- including the use of a bone graft to fill the gap and/or the use of an occlusive membrane to prevent epithelial perforation into the space between the implant and the socket wall -- to aid in the healing of this space.17-20 Bone healing in an implant osteotomy proceeds apical to coronal, therefore the coronal aspect becomes the most critical in the healing. An implant that appears to be clinically stable may have some fibrous tissue attachment at the coronal margin rather than true osseointegration, and this may not be detectable for a long time.

Current research favors the use of a barrier if a significant gap exists between the implant and the socket wall. Numerous occlusive barriers have been used, both resorbable and nonresorbable, to prevent epithelial migration into the

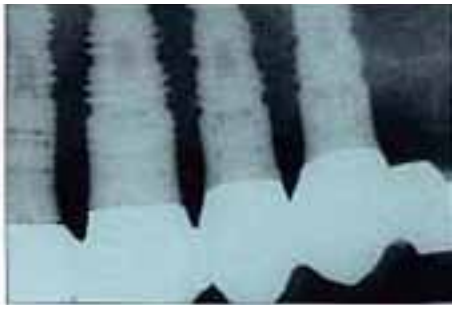
socket area.21,22 In early studies, woven e-PTFE membrane exposure was a significant complication of membrane placement.23 Newer, more-stable resorbable membranes allow membrane exposure without complication. Certain barriers -- porcine collagen and freeze-dried dermas, and laminar freeze dried bone -- can be used in techniques that do not require primary closure24 (**Figure 8**).

Historically, most clinical studies have used primary closure of the flaps over implants placed in extraction sites. Becker and Becker used the inner portion of e-PTFE membrane as an occlusive barrier over immediate implants in four patients without primary closure.25 Rosenquist used a synthetic resorbable membrane as an occlusive barrier in 10 patients and a laminar freeze dried bone membrane as an occlusive barrier in 25 patients, without primary closure.10

Figures 6h through k. The final implant restoration showing excellent preservation of the gingival form and no difference on the radiographs between the implants in the immediate and healed site

Figures 6i

Figures 6j



Figures 6k

Figure 7a. Preoperative radiograph.

Figure 7b. Immediately after placement of ITI 4.8 mm implant.

Figure 7c. Ten months postoperative radiograph (Implant prosthetics by David M. Campbell, DDS, Woodland Hills, Calif.).

The advantage of not having to obtain primary closure is the preservation of the gingival tissues (**Figure 8**f). The advantage of a resorbable membrane is that it does not have to be removed, and the collagen membranes and laminar freeze dried bone show excellent tissue compatibility. For single-stage implants, both resorbable and nonresorbable barriers have been used to cover the implant-to-socket-wall gap.26-29

Another choice is to use a single-stage implant that extends into the gingival space, or a healing cap or custom healing component on a two-stage implant, all of which will now fill the soft tissue portion of the socket completely or partially (Figures 9 and 10). The concern arises when a significant gap exists between the implant and the socket and the implant structure or healing cap is going to extend through the socket. Research favors the use of an occlusive barrier or membrane to protect the healing socket area.30

Postoperative Management

A temporary prosthesis, either removable or fixed, can be placed over the implants. However, a removable prosthesis should not put pressure on the implant or it will result in premature loading of the implant. Premature loading or vibration of dental implants has been shown to delay osseointegration and retard bone healing.

Recently, there have been studies evaluating immediate loading of

Figures 8a and b. Preoperative photo and radiograph showing #9 with a vertical fracture.

Figure 8b

Figure 8c. A wide-diameter root form implant is placed, which reduces the distance between the socket walls and the implant.

Figures 8d and e. Two resorbable collagen membranes are placed, one on the buccal because of a narrow buccal late defect and one covering the implant, eliminating the need for primary closure.

Figure 8e

Figure 8f. Healing at five weeks with preservation of gingival papillae.

Figure 8g. Temporary restoration helping shape the gingival form.

immediate placed dental implants.31 This has primarily been done where there are four or more implants extending around a curve that are rigidly splinted together.32 The authors believe that it is premature to consider loading single implants at this time since there are significant variables that may retard implant healing. The placement of a temporary crown, even one that is out of function, transmits load to the implant. New implant surfaces have been approved by the Food and Drug Administration for loading as early as eight weeks so that the time from implant placement to the placement of a temporary crown has shortened significantly, but the greater size of the bone-to-implant gap around some immediate implants may require longer healing times. The early placement of a temporary crown on an implant and the experimentation with immediate loading should not be considered by those who do not have extensive experience in implant placement and prosthetics.

Soft Tissue Management

One of the most critical factors in implant restorative esthetics is the gingival form. The gingival tissues can be shaped and managed by the temporary prosthesis and by the provisional crown that is placed on the implant prior to placement of the final crown (**Figure 11**). In areas where single-stage implants or a healing cap can be used, the implant itself may help to support the gingival tissues and the interdental papillae, which are critical for implant esthetics (**Figure 10**). In the restoration of dental implants in the esthetic zone of the maxillary anterior teeth, it is recommended that a temporary crown be considered as part of the restorative treatment plan to help shape and form the peri-implant tissues prior to placement of the final crown (**Figure 8**g).

If it is possible to place the dental implant with minimal disruption of the peri-implant tissues and provide immediate support, the management of the tissues will be facilitated. The use of anatomic gingival formers or single-stage implants and the placement of implants without elevating a flap have significantly improved practitioners' ability to readily achieve excellent peri-implant gingival form.

Figures 8h through j. The final restoration one year after completion.

Figures 8i

Figure 9a. Preoperative view of tooth #21.

Figure 9b. ITI implant immediately after placement.

Figure 9c. Four months after placement. Note bone healing around neck of the implant.

Figure 10a and b. No. 7 fractured and nonrestorable.

Figure 10b

Figures 10c and d. No. 7 an immediate implant is placed.

Figure 10d

Advantages and Disadvantages

The primary advantages of immediate implant placement are the reduction in time of therapy, the reduction in surgical episodes, and preservation of the bone and gingival tissues. The greatest rate of bone resorption occurs during the first six months following tooth extraction unless an implant is placed or a socket augmentation procedure performed.30 The early maintenance of gingival form will greatly facilitate the peri-implant gingival tissue esthetics by maintaining support for the interdental papillae (Figure 11).

The primary disadvantage of immediate implant placement is the fact that the clinician may not be able to place the implant at the time of extraction even though time has been scheduled. The patient must always be informed that although an immediate placement will be attempted, it is not guaranteed since there is always a possibility that factors such as ankylosis, bone fractures

of facial plates, socket expansion during extraction, or extensive infection might make immediate placement impossible. These areas will require extraction socket healing and possible augmentation before an implant can be placed (Figures 12 and 13).

Conclusion

Dental implants that are immediately placed into carefully selected extraction sockets have high survival rates comparable to implants placed in healed sites. The immediate-placement implants provide significant advantages of less surgical procedures, shorter treatment time, and the facilitation of improved esthetics. There are significant areas of information that need to be clarified regarding the use of bone grafts and membranes around immediately placed implants and the size of the space between the implant and socket wall. Until these are clarified with evidence-based clinical studies, clinical judgment behooves dentists to use prudence in their case selection for immediate implants. There must be adequate bone to give implant stability, and the bony walls around implants should be intact on at least three of the four sides. However, with these caveats, the immediate implant has now become a significant part of implant therapy and provides for timely esthetic implant restorations.

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Figures 10e and f. Final restoration exhibiting the same gingival form as the original tooth.

Figures 10f

Figure 11a. Preoperative #8 with a fractured root.

Figure 11b. Implant placement #8.

Figure 11c. Surgical site sutured with minimal displacement of the interdental papillae.

Figure 11d. Radiograph of implant #8.

Figures 11e and f. Temporary removable appliance used to shape and support the gingival papillae.

Figure 11g. Healing cap placed.

Figure 11h. Final crown with maintenance of interdental gingival form.

Figure 12a. Radiograph #8 shows a large radiolucency associated with a root fracture that precludes immediate implant placement.

Figure 12b through d. Extraction and augmentation of the socket.

Figures 12c

Figures 12d

Figures 12e and f. Healing and tissue support from the removable appliance.

Figures 12f

Figures 12g through i. Implant placement eight months later.

Figures 12h

Figures 12i

Figure 12j. Implant site and uncovering.

Figures 12k and l. Implant restored with temporary crown 12 months from extraction. The two-stage approach takes considerably more time and more steps than immediate placement.

Figure 12l

Figure 13a. Preoperative radiograph. Tooth #6 was not a good candidate for an immediate implant because the root fracture had caused too much vertical and horizontal bone loss on the facial bone.

Figure 13b. Preoperative photograph.

Figure 13c. Surgical view of missing facial bone.

Figure 13d. Photograph of extracted tooth.

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Laser Curettage: Where Do We Stand?

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ABSTRACT The literature suggests that curettage has no benefit beyond traditional scaling and root planing. However, claims abound as to the benefits of curettage with the laser, including less postoperative pain, less bleeding, and reduction in microbial count. This paper explores whether any of these claims are true and whether laser curettage has any benefit in periodontal treatment.

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Gingival curettage has been around a long time. Hirschfeld1 listed four objectives of subgingival curettage:

- Remove all calculus;
- Remove granulation tissue;
- Cause hemorrhage to reduce edema; and
- Remove epithelial lining of the pocket.

When achieved, these goals appeared to have a predictably beneficial effect on the periodontal condition of most periodontal patients. Ramfjord and colleagues2 documented the superior efficacy of this treatment regimen over no treatment at all. However, questions remained as to whether scaling and root planing or curettage, or even perhaps an interaction between the two, was mostly responsible for the observed improvement. Chace3 found that scaling and root planing was indispensable in this process and that it was questionable whether additional curettage was needed. Ainsle and Caffesse4 biometrically evaluated the results of scaling and root planing alone as opposed to scaling and root planing followed by gingival curettage. They found no difference in pocket depth reduction, no increase in attachment level, and no decrease in inflammation with the curettage. This, of course, suggested that gingival curettage is not necessary. Echevarra and Cafesse5 found that, in suprabony pockets, performing gingival curettage one month after scaling and root planing offered no additional benefit, again suggesting that curettage is not necessary. Lindhe and Nyman6 found that "granulation tissue removal in conjunction with flap surgery is not a critical measure for the establishment of conditions which are conducive for proper healing of the periodontal tissues."

Thus far, the only objective of Hirschfelds' original four that apparently

remains supported by the literature is the first: removal of all calculus. In 1989, the Proceedings of the World Workshop in Clinical Periodontics7 defined root planing as "a definitive treatment procedure designed to remove cementum or surface dentin that is rough, impregnated with calculus, or contaminated with toxins or microorganisms. ... When done in a thorough fashion, some unavoidable soft tissue removal occurs."

It thus seems that whatever soft tissue removal may be necessary may well occur during scaling and root planing and not require a separate effort through intentional curettage.

So, if additional curettage is not required after scaling and root planing, what is the justification for doing it with the laser? Claims of potential benefit abound. For example, claims of less postoperative pain8,11 and less bleeding8 are common, and also claims of reduction in microbial count.9-18 Interestingly, however, a distinction has been made between lowering the live bacterial count and removing bacterial accumulations from within the pocket.19 Could one be more important than the other? If so, how does scaling and root planing compare to laser therapy in achieving it? Does the reduction of the numbers of live subgingival microorganisms result in a clinical improvement? Is this alleged reduction of the numbers of live microorganisms by the laser sufficient rationale to justify its use? Just what are the benefits of intrapocket laser therapy? And, of course, what are the disadvantages? This paper is intended to give answers to these and other related questions.

Pulsed Infrared Energy in Tissue

The interaction of pulsed infrared laser light at 1.064 ìm wavelength is central to the understanding of all that follows. It is also where there is disagreement between some proponents of Nd:YAG (neodymium: yttrium aluminum garnet) laser curettage and those who still find themselves in opposition to this particular wavelength in this application. The critics' concerns are about the risk of significant collateral damage and lack of demonstration of effectiveness in improving the periodontal condition, notwithstanding the FDA's acceptance of "equivalency" with standard scaling and root planing. White and colleagues20 have explained their position on this interaction:

"Tissue specificity and absorption of a specific emission wavelength applies only when there are linear optics with low energies such as spectroscopy ...

"The body is relatively opaque to laser light and penetration (transmission) of photons into tissue does not necessitate deep damage, any more than holding your hand in front of a bright light. Clinical laser use is a photothermal event occurring at the surface from the absorbed laser light ...

"Contact delivered pulsed Nd:YAG lasers do not cause the deep thermal penetrations as seen with non-contact continuous wave systems."

One might paraphrase this by saying that pulsing of the energy in current dental Nd:YAG laser systems provides intense enough energies at the fiber tip to negate the normal optical (i.e., transmissive) properties of the tissue and generate heat only at the surface where the tip is touching the tissue. While this wavelength of light penetrates to a significant depth in the tissue when in lower-intensity modes, such as continuous-wave, and carries along with it the risk of collateral damage in those areas, pulsing the energy prevents the penetration. Since the body is "opaque"20 to pulsed energy, there is no need to worry about penetration, bone death, pulpal denaturation, etc. during laser curettage. While this position explains in large part the tendency of much of their work to ignore the effect of transmitted light (not heat, but light), it is nevertheless contradicted by much of the current clinical evidence. Furthermore, this position is scientifically untenable. For while at exceedingly high fluences, dielectric breakdown and nonlinear response (e.g., plasma formation) can occur, this is typically more common with Q-switched lasers than those currently used in dentistry. Next, the analogy of holding one's hand in front of a bright (albeit low-intensity) polychromatic light to explain monochromatic, high-intensity, pulsed laser exposure is open to criticism to say the least, and certainly does not qualify as a scientifically justified explanation. Research into this phenomenon has suggested otherwise, calling into question the validity of this position.21 Furthermore, their characterization of clinical laser use as "a photothermal event occurring at the surface from the absorbed laser light" is only a partial truth. But so often, the partial truth can lead one down errant pathways as easily as an outright mistake. Tissue effect arises from both the deposition of energy to increase thermal vibrations (temperature) but also, at various points, the deposition of the latent heats of phase transformation, which, when satisfied, change phases in the components of the material in an essentially nonthermal fashion, i.e., these phase changes are typically associated with no concomitant increase in temperature in homogeneous materials and will occur over a relatively small temperature range in heterogeneous materials. In addition to this, one must understand that heat is created in two ways with a contact-tip Nd:YAG laser: 1) the tip itself heats up, and 2) transmitted energy is eventually absorbed at depth, after some scattering, and heat is generated at the point of absorption. Initially, 100 percent of the energy flows through a new tip; but, as time passes, the imperfections and nonzero absorption coefficient of the tip as well as cellular debris on the tip continue to absorb heat and increase in temperature. This temperature increase causes further imperfections in the lattice structure

of the tip, resulting in even more temperature increase. The increase in absorption by the tip and debris, however, has limits. So, while the amount of energy transmitted through and beyond the tip does, in fact, decrease with exposure time, it levels out at a positive value and never goes to zero.21 What does this mean? There is always residual light energy directly transmitting into the tissue. And, of course, the response of the tissue to this is cumulative in nature. With Nd:YAG laser techniques often lasting 60, 120, 180 seconds or longer, the risk of damage is real and should be histologically determined prior to recommending intrapocket Nd:YAG laser therapy. And, of course, none of the above has addressed the lack of clinical evidence of any added benefit to using a laser.

Clinical Effects

Perhaps the one thing that all would agree upon is that patients like the idea of laser therapy, even if no clinical advantage to its use can be demonstrated.22 White and colleagues23 compared scalpel surgery to Nd:YAG laser surgery on patients with probing depths greater than 3 mm, slight inflammation, intact crestal lamina dura, and no radiographic evidence of bone defects. In other words, patients who most probably had early periodontitis. No detailed description was given of the actual surgeries performed, except that they were performed by dentists who were trained in the use of the Nd:YAG laser. Their conclusions were that the Nd:YAG laser produced an equivalent result to scalpel surgery, and that it was less painful and produced less bleeding. In a related study, the histological difference between noncontact and contact Nd:YAG tissue effect was demonstrated24 and corroborates the study demonstrating decreasing transmission in the contact application.21 Epstein described the Nd:YAG laser curettage technique as follows:

- Use a 320 m m fiber, 1.5-2.0 W, 15-20 pps;
- Insert to pocket depth and irradiate, keeping fiber parallel to root;
- Move fiber horizontally and vertically for 90 seconds or more;
- Stop when there is fresh blood;
- Local anesthesia is usually not needed.

Cobb and colleagues25 in 1992 noted root damage in all specimens where the Nd:YAG laser was used. In addition, they found residual plaque and calculus remaining in all groups and decreased numbers of live bacteria. This further emphasizes the distinction between killing bacteria and removing the plaque and underscores the question of what relative effect each of these potentially independent variables may have on the final attachment measurements. However, this study was criticized because the fiber was oriented in a perpendicular fashion to the root surface. The critics' hypothesis was that this perpendicular orientation biased the results to show more damage than in the more clinically relevant parallel orientation. Here, it was presumed that the energy would only strike the root surface at a shallow angle, reducing the risk of root damage. Another study by the same group two years later was performed with the fiber in a parallel orientation to the root surface. Similar results were obtained.26 Root surface damage and decreased fibroblast attachment to the laser-treated surface was found. Furthermore, root planing after laser treatment rendered the root biocompatible again. This suggests that the nonbiocompatible laser-induced damage is shallow and can be removed with root planing.

Gold and Vilardi27 attempted to look at the histology immediately after Nd:YAG laser curettage. While in their legends and text they describe sharp margins with intact nuclei and conclude that the Nd:YAG contact-tip laser can remove sulcular epithelium without collateral damage, their histology shows a remarkable degree of cellular disruption, in one figure extending throughout most of the height and thickness of the tissue. This cellular teardrop-shaped disruption is conceivably the result of deeply scattered and absorbed Nd:YAG laser light. If it were solely from surface heat, one would expect a more radial nature to the distribution of the disruption. Gold and Vilardi27 also noted little evidence of necrosis in the specimens. However, the specimens were taken immediately after laser exposure, and no time for delayed cellular death was allowed. This violated Stanley's principle of investigating tissue response to irritation. In it, Stanley suggests that multiple teeth be looked at during several postoperative intervals to accurately determine the tissue response.28

In 1995, Henry and colleagues13 reported that the argon laser was able to selectively kill bacteria, with pigmented species being more sensitive. Finkbeiner29 performed "selective pocket thermolysis" with an argon laser along with root planing and showed decreases in pocket depth. However, there was no comparison of root planing to root planing and laser. The contribution of the laser to the final result, again, was in question. Wilder-Smith and colleagues30 looked at the effect of the Nd:YAG laser on root surfaces. They found that the Nd:YAG laser could remove the smear layer in certain instances, but that the effect was inconsistent. This corroborates the inconsistency of results with this wavelength in dentin previously documented by Dederich and colleagues.31 However, they also found that the intrapulpal temperature increased from 9 to 22 degrees Celsius, and the surface temperature increased from 18 to 36 degrees Celsius. This suggests the existence of a significant thermal threat to the dental pulp posed by the Nd:YAG laser. Radvar and colleagues14 also investigated the Nd:YAG laser in periodontal pocket therapy, comparing laser alone with scaling and root planing alone. They found that only the root planing group showed a significant reduction in probing depth or

bleeding on probing. Both groups showed a reduction in colony-forming unit counts, but only the root planing group sustained the reduction until the sixth week. They concluded that the Nd:YAG laser did not improve the periodontal outcome. Ben Hatit and colleagues15 looked at the effect of a pulsed Nd:YAG laser on subgingival bacterial flora and the cementum, and compared it to scaling and root planing alone. They found that all laser groups showed reduced live bacterial counts, but that the laser caused root surface damage.

By this time, it seemed clear that removal of debris from the root surface was paramount, regardless of the absence or presence of any added benefit from the laser. So, a natural question to ask was whether the laser removes debris from the root or the pocket. The consensus developed from studying the literature by the American Academy of Periodontology, and quoted from the 1996 position paper,32 was that "there is little evidence that lasers ... have any value in removal of accretions from the root surfaces, nor for any other form of root debridement in vivo."

"The application of Nd:YAG laser to root surfaces results in alterations in root surface protein mineral ratio, affects the ability of fibroblasts to attach in vitro, and alters the nature of the smear layer following conventional scaling and root planing. It is as yet unclear if these surface alterations are beneficial or detrimental.

"The ability of a laser to remove the pocket soft tissue lining or to remove bacterial accumulations are as yet unknown.

"Furthermore, there are no research data that support the use of lasers for subgingival curettage."

Moritz and colleagues16 looked at the effect of a diode laser (805 nm) in 50 patients and found that it facilitated live bacterial reduction, especially Actinobacillus actinomycetemcomitans In 1997, Cobb33 cautioned against the use of lasers within the pocket:

"Despite the suggestions that lasers are a desirable alternative to traditional periodontal root instrumentation and the recent FDA [clearance] of the Nd:YAG laser for such an application, numerous peer-reviewed articles concerning in vitro and in vivo results strongly suggest caution with respect to clinical application.

"There appears to be a high potential for laser-induced irreparable physical damage to the root surface"

Moritz and colleagues17 again looked at the effect of the diode laser, comparing scaling and root planing alone to scaling and root planing followed by laser irradiation. He noted a decreased live bacterial count in those pockets treated with the laser compared to root planing alone. However, no improvement was mentioned in pocket depths or attachment gain.

A consensus report34 was published in 1998 that looked at surgical and nonsurgical pocket therapy. With regard to whether the soft tissue lesion should be surgically removed, the consensus was that "there is no support for the deliberate excision of the soft tissue lesion during periodontal flap surgery, with or without osseous recontouring, in order to reduce or eliminate the periodontal pocket."

Spencer and colleagues35 looked at the effect of CO_2 and Nd:YAG laser exposure with and without surface water cooling on oral soft tissue to the underlying bone. They found the Nd:YAG laser caused far greater increases in temperature (8.0 to 11.1 degrees Celsius) than the CO_2 laser (1.4 to 2.1 degrees Celsius). They concluded: "At energy densities equal or above those reported here, the increase in temperature at the bone surface as a result of periodontal soft tissue surgery with the Nd:YAG laser could be damaging, especially if the exposure is prolonged."

Liu and colleagues36 compared laser to scaling and root planing both alone and in combination with regard to IL1-β response. The degree to which this cytokine is present in the gingival crevicular fluid is closely associated with periodontal destruction. It was found that:

- The laser was less effective than scaling and root planing in reducing IL1-β;
- Inclusion of scaling and root planing had a superior IL1-β response compared to other therapies without it; and
- No additional benefit was found when the laser was used secondary to scaling and root planing.

In another study, histological evidence of severe pulpal damage was presented by Tokita and colleagues.37 They held the Nd:YAG fiber tip stationary against the crown of the tooth and irradiated for 60 seconds at 2.0 W, 20 pps, and 150μs pulse width. The histology presented demonstrated holes burned through the pulp and contradicts White and colleagues20 in dramatic fashion in that it depicts the path of direct light penetration and not thermal conduction from the external surface of the tooth. Further dramatic and convincing evidence of the threat of penetrating pulsed Nd:YAG light was presented by Sunakawa and colleagues38 when they used a scanning technique instead of holding the tip stationary. They found massive pulpal damage concomitant with decreased neuronal function (i.e., lack of sensitivity). They also noted that this pulpal damage occurred without any histological change in the dentin, meaning that the damage occurred without the clinician being able to see any change in the dentin. In conclusion, they stated that "clinicians should not use this kind of laser carelessly to desensitize hypersensitive dentin."

Moritz and colleagues18 found that the pulsed Nd:YAG laser could selectively kill some bacteria after transmitting through dentin, again contradicting the opacity theory of White and colleagues.20 Chen and colleagues39 looked at the effects of pulsed Nd:YAG laser energy on human fibroblasts in vitro. They found that the fibroblasts demonstrated cytomorphologic changes to cell death, the amount of which was

proportional to the power settings. They warn of potential damage and suggest minimizing the exposures if this laser is to be used in periodontal soft tissue. Kreisler and colleagues40 looked at the effect of the Ga-As laser (810 nm) on human gingival fibroblasts in vitro and concluded: "This laser may cause collateral damage when used for periodontal pocket decontamination. Further research is needed to determine clinically acceptable exposure regimens."

Discussion

Perhaps the most striking feature of the body of literature examining laser curettage is that no evidence exists that documents any improvement in attachment or pocket depths over scaling and root planing alone. This, in reality, should not be surprising since the purported objective of the laser in the first place is to remove the sulcular soft tissue lining, and that has been shown by the periodontal literature to be unnecessary. While there is evidence documenting the bactericidal nature of intrasulcular use of pulsed Nd:YAG laser energy, improvements in periodontal health have not been shown, and may indeed be wishful thinking. There is a preponderance of evidence documenting root damage, pulpal damage, and other forms of collateral damage from pulsed Nd:YAG laser use on the periodontal tissues. This alone should be reason enough to avoid using this laser until there is better information defining the energy thresholds that will avoid clinically significant and irreversible collateral damage to the pulp and periodontium. However, being able to demonstrate acceptable damage control is not sufficient for laser curettage to be justified. Safety must coincide with convincing evidence of benefit to the patient. Unfortunately, even after more than 20 years of promotion of the intrasulcular use of the pulsed Nd:YAG laser,41 neither is in evidence. Based on the literature presented here, it appears that to use the pulsed Nd:YAG laser for curettage is to introduce risk to the patient with no demonstrable benefit; and this suggests that it is time for the scientific discussion of Nd:YAG laser curettage to expand to include ethical considerations.

Ethical and Legal Considerations

Hippocrates said, "I will follow that method of treatment which, according to my ability and judgment, I consider for the benefit of my patients, and abstain from whatever is deleterious and mischievous."42

Dentists have an ethical obligation to uphold the Hippocratic oath and not create false hopes for their patients. Also, court rulings have required that patients be told about all the risks of therapy and alternatives. This would mean that if the laser is used for curettage or sulcular debridement, the patient needs to be aware that there might be damage to the root, bone, soft tissue, and pulp with no demonstrative clinical benefit. It is also unethical to claim the laser will disinfect tissue or prevent bacterial infection when the FDA clearly stated that these claims and claims of Nd:YAG laser for excisional new attachment procedure were not permitted.43

In promoting "laser assisted periodontal therapy," one should use randomized blinded controlled longitudinal clinical trials, or longitudinal studies or case-controlled studies44 and not uncontrolled case reports and hearsay evidence. Until the appropriate evidence-based studies are published and there remains a possibility of damage to the patient, dentists and dental auxiliaries should be discouraged from using the Nd:YAG or comparable laser in the region of the sulcus or periodontal pocket because it may be difficult to defend such damage in a court of law.45

Conclusion

Laser curettage following scaling and root planing, like traditional curettage, adds no benefit or improvement. The reported decrease in sensitivity that contributes so much to its popularity may well be due to pulpal damage. Damage to the root and periradicular tissues by the laser is a common result of laser curettage. In view of the documented risk of collateral damage and lack of added value, there is no reason to use the pulsed Nd:YAG laser for intrasuclular pocket therapy.

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Periodontics Today and in the Future

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Author

Gordon L. Douglass, DDS, is a past president of the Sacramento District Dental Society, a past president of the California Society of Periodontists and has practiced in Sacramento for the past 29 years. Dr. Douglass will assume the presidency of the American Academy of Periodontology later this year.

Periodontics, like all areas of dentistry, has changed significantly during the past 25 years. Through treatment and prevention, dentistry has changed the dental disease profile of the American public. The average patient has less caries, less periodontal disease, and more teeth than the patient of 25 to 30 years ago. In 1973, almost 50 percent of the population age 65 to 74 was edentulous; today that number is less than 30 percent. The number of partially edentulous patients has declined as well. The effect of fluoride, preventive care, and dental treatment has been significant. The gradual decrease in dental disease will continue, and we will all be treating healthier, older patients.

Periodontal services in particular have increased dramatically during the past 25 years. A study on dental services from 1980 to 1995 by Eklund showed an increase of 89 percent in periodontal services in 25- to 34-year-olds and 56 percent in patients 65 years or older. The vast majority of this increase was in nonsurgical periodontal services provided by general dental offices. Today, the increase continues for patients 65 or older, but the overall number of periodontal services provided by all of us in dentistry is declining according to American Dental Association data. This confirms the continued dental health improvement of the patient base we all treat.

The specialty of periodontics, like all of dentistry, is changing to meet the demands of our patients. There has been and continues to be an increasing demand for cosmetic and regenerative services, including dental implants. As restorative dentistry offers improved esthetic options for teeth, periodontics offers an ever-improving array of cosmetic procedures to support the efforts of the restorative dentist. The advances in regeneration of lost hard and soft tissues in periodontics have led to a trend of reduction in resective surgery and an increase in regenerative therapy. Predictable evidence-based treatments for gingival tissues and bone are available today and will continue to increase in the future. It is anticipated that this shift will continue, combined with a trend toward microsurgery, which is significantly less invasive than older surgical techniques.

Today, the most rapidly growing area in periodontal practice is the placement of dental implants and regeneration of lost soft and hard tissues for future implant placement. Extensive periodontal research into bone regeneration during the past 15 to 20 years has provided the science and techniques for this increase, and periodontists' close involvement with restorative dentists in the prosthetic rehabilitation of patients with damaged dentitions has provided the clinical

collaborative skills necessary for this growth. Today, there is extensive research in bio-engineering science, which will revolutionize our regenerative services of tomorrow.

The management of the periodontal patient in the future will be affected by a variety of factors. The first and perhaps most important is the relationship of periodontal disease to systemic disease. Two areas -- diabetes and low-birth-weight premature babies -- have been shown to have direct links to periodontal disease severity. For patients with diabetes, significant periodontal disease may make stabilizing their diabetes more difficult; and, conversely, if they have periodontal disease, it may increase in severity and be more difficult to bring under control if their diabetes is not stable. Recently, Marjorie K. Jeffcoat, DMD, announced that her Alabama research team's first interventional data showed a significant reduction in the incidence of premature babies in their high-risk group with scaling and root planing in the second trimester of pregnancy.

The other systemic link of concern is the relationship between periodontal disease and cardiovascular disease. Significant periodontal disease appears to be a risk factor for cardiovascular disease. People with periodontal disease have twice the risk for heart attack and stroke. The exact nature of the relationship is not known today, but with studies continuing to show an increased risk for individuals with extensive periodontal disease and tooth loss, prudence recommends attaining periodontal health to aid an individual's overall health.

Periodontal therapy will continue the present evolution of becoming more biologically based and less invasive. Our current crude assessments of risk factors, such as smoking and diabetes, will improve dramatically with effective tests and evaluations that will aid the therapist in directing therapy to the specific needs of an individual patient. There will continue to be an increase in host-modulating agents and inflammatory mediators, which will aid in the management of susceptible patients. Much of the treatment of early to moderate periodontitis will be provided by general practices with ever-increasing sophistication and skill. Surgical procedures will continue to become more focused and less invasive with an emphasis on regeneration of lost or damaged tissues. However, for the near term, we will still need to rely on mechanical debridement to decrease the bacterial load and promote healing.

The advances we have made in the past 25 years in prevention, disease management, and tissue regeneration will seem minor compared to the advances in the near future. Shortly, we will have diagnostic tests that will be truly prognostic with the risk information they will give the therapist. Host-modulating agents such as inflammatory mediators will greatly improve the host's response and resistance. Tissue engineering will replace or augment today's surgical procedures. Our patients will continue to be healthier and have improved prevention techniques. Overall, the future of periodontal health as well as the overall dental health of the American public looks very promising.

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Buy Bread, Pick up Dry Cleaning, Write Column

Robert E. Horseman, DDS

What did Attila the Hun, Hernando Cortez, Albert Einstein and my mother all have in common? They made lists. They all fervently subscribed to the notion that the hallmark of an organized person was the ability to create a written plan as a means of channeling his or her energies economically. In short, a list -- a tangible map of things to do, stuff to get, events to remember.

It is no secret that civilization has been built upon the ability to make and read lists. Early lists, for example those given by Eve to Adam, were simple enough:

- Weed the Garden
- Bring home some apples
- Watch out for snakes

Attila's list, inscribed on the inside of his shield, was short and to the point:

- Pillage
- Plunder
- Scavenge
- Rape
- Find out what "Hun" means

Later, Cortez tucked a parchment in his tunic reminding him to:

- Get WD-40 for armor
- Avoid jalapeño peppers after 10 p.m.
- Discover the Pacific Ocean

Historians, even today, are still deciphering Einstein's lists scribbled in his Teutonic thoroughness on the backs of envelopes and street car transfers. It was hard to fathom whether he was giving himself a memo to bring home some bratwurst or evolving another theorem of relativity. There are some who contend that the relativity theory for which he is so famous, is really a lengthy list given to him by Mrs. Einstein instructing him to get, among other things, a haircut.

The point is, society cannot function without lists, a fact that my mother understood only too well. My father and I never left home, even to venture into the backyard, without a list, in my case pinned to my breast pocket upside down so I could readily refer to it. Women universally acknowledge this fact: Never, ever, send a man to the grocery store without a list. Without one and foraging only on verbal instructions, he is as likely to return with a selection of single malt whiskies and a Hot Rod Magazine as with the frozen vegetables and toilet paper he was sent for.

From time immemorial, list-making was accomplished on whatever was handy, even on the back of one's hands if no scrap of paper could be found. Marriages dissolved, nations floundered and individuals lost their minds frequently because there was no uniformity in lists. A haphazard list, although better than no list at all, was the direct cause of misunderstandings, especially if scribbled on cellophane or bits of Formica.

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It was up to the King of Stick, Dr. Spence Silver of the 3M Company in one of those serendipitous events that change the course of the world, to stumble upon what we know today as the Post-it Note. An adhesive that didn't really stick or a glue that didn't bond wasn't exactly what Silver was looking for. It wasn't until somebody pointed out that if you laid a strip of this non-glue on the back of a little yellow square, you'd have the beginning of a perfect list format. "Well," marveled 3M marketing mavens, "this changes everything!" Dr. Silver's failure made him the Post-it Boy of 3M, a corporate hero. Why your failures never turn out this way remains a mystery.

Today Post-it and its imitators are ubiquitous. List-making and its upscale cousin, the memo, have come into their own. No longer the mandatory requirement of persons afflicted with memories akin to shrubbery, the list can be seen in all colors of the rainbow and displayed prominently on all possible surfaces, including foreheads. Even people who can easily recall what they left the room to get and remember to always put down the lid and to not run with sharp sticks voluntarily make themselves lists. No apologies, no tittering about "senior moments," or forgetting to bring home the dry cleaning.

Can you imagine the impact this invention would have had on the history of the world if Columbus had a note stuck to the helm of the Santa Maria cautioning "India is East of here, not West." If only Captain Cook's mother had stuck a Post-it on his ship in plain sight stating "Don't mess with the natives. They only look friendly!"

Julius Caesar could have had a nice light blue one to match his eyes and stuck on the handle of his sword with this important information:

- Beware the Ides of March!
- Find out what "ides" are
- The sleepover barbecue was canceled
- Watch for guys in bed sheets waving steak knives!

The Oval Office could have benefited from a note attached to the presidential desk suggesting to JFK that "Hold the Bay of Pigs thing -- doesn't sound kosher -- is there a Bay of Bunny Rabbits? Have Henry look into it."

May I suggest you make yourself a list right now. At the top of which, place this reminder on the note color of your choice:

- Send the author of this article a large sum of money in small, unmarked bills.

Stick it right on your checkbook. Thank you!