CDA

JOURNAL OF THE CALIFORNIA DENTAL ASSOCIATION VOL.26 NO.11

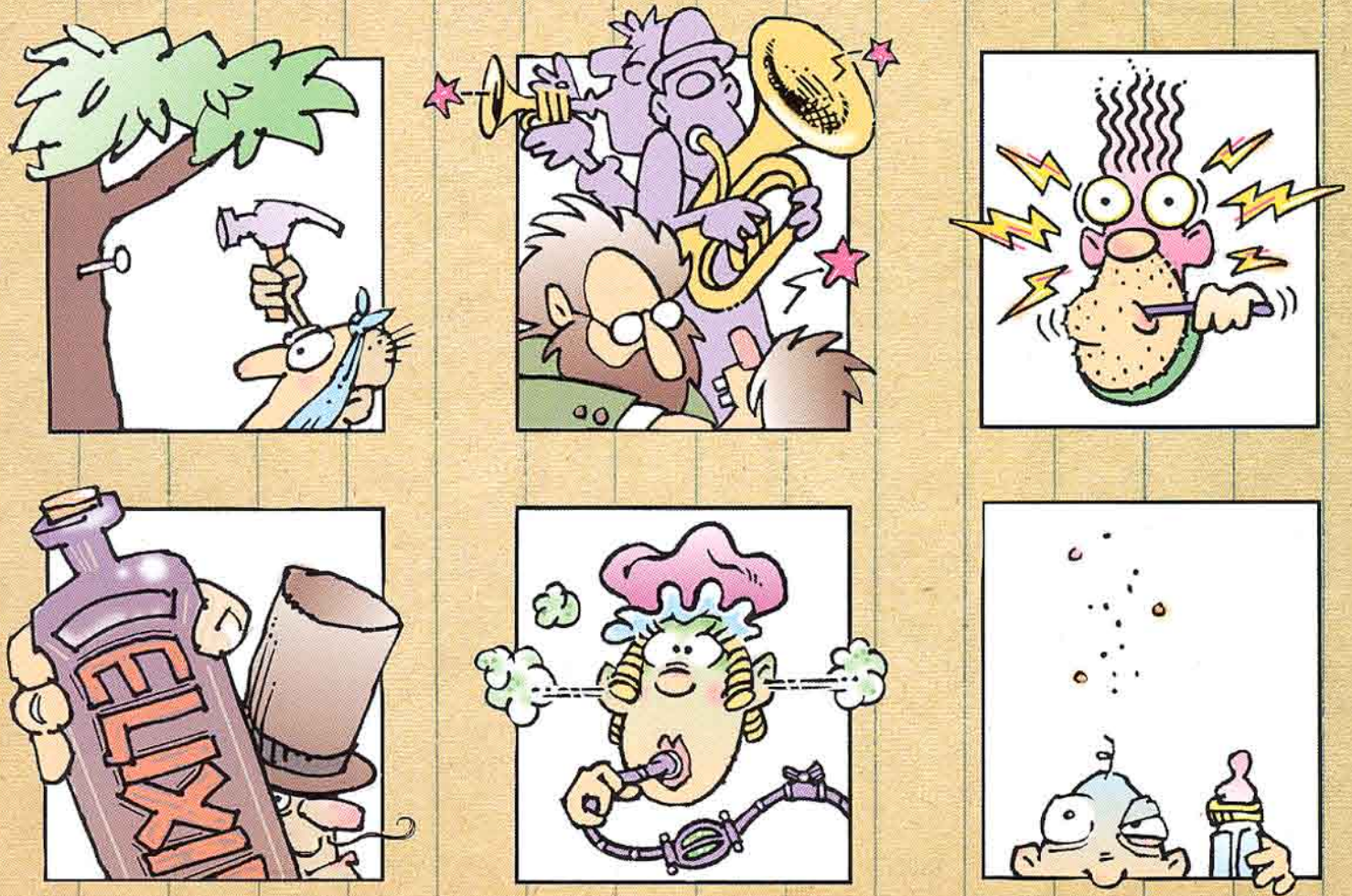
November 1998

The Evolving Demographics of New Grads

TMD Issues

QUACKERY

~ A Historical Perspective ~



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OF THE CALIFORNIA DENTAL ASSOCIATION
Journal
CDA Journal
Volume 26, Number 11
NOVEMBER 1998

DEPARTMENTS

FEATURES

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Reality Check

Jack F. Conley, DDS

Over time, some readers have let us know that they have a preference for scientific articles that explore new frontiers of significance to the dental practitioner as opposed to review articles that summarize findings from the literature which support contemporary standards of care, treatment techniques, or scientific information. While there can be great value from a good review article, the dentist who understands the business environment of today, increasingly prefers information that is "cutting edge," because it may initiate consideration of new procedures that will position him/her as unique within their community.

The experts who serve as peer review referees for the Journal continually make us acutely aware of manuscripts that present a limited study on a new product or technique which has received little previous discussion or evaluation in the literature. The reviewers may point to lack of current references that validate the conclusions of the author (often referring to the supporting evidence supplied as anecdotal). They may also raise concern about the potential conflict of interest of the author due to their perception that the author might have a relationship with the company that developed or markets the product or technique, or funded the research study that is being reported in the manuscript.

A few events have helped to shape our concern with this developing dilemma faced by publications. A noted dental authority recently made a comment during a presentation to a dental audience, that there wasn't much that was really new in dentistry these days. While the statement could be actively debated, this person's point was that products and techniques that are decidedly new advancements are few in number. The "spin" of the marketing activity for materials and techniques used in the delivery of cosmetic dentistry may hold more promise to dentists and patients of something "new" than the properties of the materials or the techniques actually used in their application!

Another event that caught our attention was an editorial by a CDA component society editor who described an undesirable continuing education program experience. He correctly complained that the lecturer, a noted (and respected) dental authority had spent a considerable amount of time during an educational program shamelessly promoting a dental product. Many dentists have been exposed to this type of experience. This is a slightly different problem than the dilemma we will describe, as we believe there is a big difference between promotion of a product in an educational environment, and a published report of data that came out of an agreement that did involve financial support to the author or investigator.

Because there are few new developments, it seems that there is a tendency to "rush" anything that is even slightly new forward for appropriate approvals and immediate use in practice. There is also a prevailing attitude that suggests that clinical experience with new techniques and products will provide the data that was not forthcoming from the limited research that occurred before it was approved and sent to the marketplace. It seems that materials and techniques too often are promoted in the marketplace before scientific data is available to help the practitioner make important decisions toward their use.

One of the goals of a publication like CDA Journal is to provide readers with

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timely scientific information of educational merit as soon as it has received appropriate peer review. Based upon the scenario described, there are fewer opportunities to present scientific information that is really new. When something fitting the desired criteria does surface, then the dental clinicians/authors most likely to be experienced enough with a new product or technique to prepare a scientific manuscript are also most likely to have a financial relationship with a private corporation as a consultant to test or develop the modality in question. Gone are the days of the 18th century, when the "Father of Modern Dentistry," Pierre Fauchard, shared his considerable knowledge of dentistry with his colleagues in print without financial considerations.

It is a different world today! We were surprised to hear an estimate from the publisher of the Journal of the American Dental Association, that up to 80 percent of research articles submitted for publication review are funded by private corporations that utilize dentists as consultants.

The dilemma for publications is obvious. Should we withhold publication of information with merit to the practitioner because the author has a financial relationship with a company marketing a product, thus preventing practitioners from having any access to information that might help them in making an informed decision about a product? Or, can a disclosure attached to a peer reviewed manuscript permit the practitioner to receive important information that would otherwise be denied him/her due to the perceived fear of influence of a financial agreement between author and corporate entity upon the quality of the new research findings?

We believe that the only answer to this dilemma is an up front disclosure statement accompanying a scientific article, alerting the reader to the relationship of the author to the firm marketing products or technology to dentistry. We believe that this approach is the direction for a profession interested in providing the best level of care for the public it serves. To delay a reasonable discussion of a new material until significant new research becomes available does not seem to be in the best interests of a progressive profession.

The problem with a continuing education lecture is clearly different. A lecturer should not stray from the announced educational objectives by promoting products and technologies. To do so is a misrepresentation of the educational experience expected by the dentist attending a course. Further, unlike the printed word, it commandeers a captive audience.

If readers are to overcome the seeming lack of information on new entities being promoted in the dental marketplace, they must have access to new information so that they might assume some responsibility in evaluating the efficacy of new materials, equipment, and techniques. We believe that peer reviewed publications must fulfill the responsibility to provide this information.

This is a new reality as we inch ever closer to the 21st century! Dentistry has come a long way from the simple 18th century world of Pierre Fauchard.

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Care for the Poor Is Stricken Dentist's Legacy

By David G. Jones

A critical juncture in dental health was fast approaching a decade ago in an otherwise serene northern California valley known best for its fine wines and restful spas.

As the crisis reached its boiling point, a Napa general dentist with a giving heart stepped in to bring the community together to turn down the heat and assuage the hurt.

Despite the desperate nature of the problem he has helped solve, today Lawrence E. Hess, DDS, is facing an even greater threat: last December he was diagnosed with pancreatic cancer.

Now, a grateful community is once again coming together because of Hess, 51, this time to show their thanks to him for his transcendent efforts to establish dental care for the area's poor, which was basically nonextistent when he took the project to heart.

Hess was honored August 18 when the Napa County Board of Supervisors presented him with a resolution praising his work in providing dental care to the county's indigent population, which began in 1988 when Hess and Napa oral surgeon Greg Winnen, DDS, co-founded an austere, volunteer-staffed children's dental clinic in Napa's Queen of the Valley Hospital.

"In the late '80s there was truly just nobody in Napa County accepting DentiCal patients, other than on an emergency basis," Hess says. "The hospital was treating a lot of children's dental emergencies. I think there was also a lack of understanding on dentists' part in the county as far as how great the problem was."

Catholic Sister Ann McGuinn, who was working at the time at Queen of the Valley Hospital, recognized the problem and now recalls the clinic's humble beginning.

"We found a little space in the hospital, got some equipment donated, and started a small clinic staffed by volunteer dentists from the Napa-Solano Dental Society every Friday," says McGuinn, now vice president for sponsorship at St. Joseph's Hospital in Eureka. "We got the clinic started through the efforts of Larry and his dedication. He's a very gentle and compassionate man, who is very good with the children, and was instrumental in getting other dentists interested in helping."

It wasn't long before it became apparent to Hess that there was a tremendous need, and it wasn't being serviced even through the voluntary effort. So after moving to another location for about a year, Hess and Winnen teamed up again early in 1991 to start a permanent clinic.

"We were able to get a grant from the state, and through a lot more effort things got rolling," Hess says.

The Sister Ann Community Dental Clinic, named for McGuinn, has five operatories, a full-time staff, and two full-time dentists. Last year, the clinic served more than 6,000 low-income residents. Sixty percent of the patients were under age 20, and DentiCal pays most costs with help from the Napa Valley Wine Auction.

General dentist Edward Bartlett, DDS, has worked at the clinic since it opened. He readily found an analogy to describe Hess' persistence in finding solutions to problems of any size.

"Hess is very focused, like a bulldog," Bartlett says. "If he hears of a problem, he just grabs onto it until it gets solved."

The clinic was more of a triage center when it opened, and its staff was confronted with children who had suffered through an almost complete lack of dental care. Sorting though those potential oral disasters and working on the most serious and debilitating problems was the initial challenge.

"We worked for several years to get most of it under control in this population," Bartlett says.

But the work was effective, and now the clinic's focus has turned to maintenance and preventive dentistry.

Since being stricken with cancer, Hess has stepped back from dentistry, having sold his practice in February to spend more time with his family. But his legacy remains an animating factor in the clinic he worked so hard to start.

"We're fortunate to have some good dentists and staff who treat patients fairly and with dignity," Hess says. "It's that simple. I believe that by giving I receive more. Many people find outlets, and this is certainly one that you can do and know you're doing something good for others."

When Hess became ill, many dentists and friends offered their help.

"We all took his emergencies on various days, and other dentists in Napa checked exams, maintained the hygiene schedule and kept his practice working," says Samuel E. Gittings, DDS, a Napa general dentist. "It was amazing and very heartwarming to see how people responded."

McGuinn said that so many good things came about because of Hess' compassion and concern for others.

"Unfortunately, that doesn't happen

often enough," she says. "He is so unassuming, and simply did it, without any fanfare or thought about himself, just for the children's sake. The two full-time dentists at the clinic are really wonderful, but I wish I had another Dr. Hess."

Hess tries to make an objective assessment of his illness.

"It's an interesting transition, one of the things that we all go through, one of the surprises in life," says Hess, a 1971 graduate of the UCLA School of Dentistry. "But I can't overemphasize how much the support from the community helps."

TB Continues Its Lethal Ways

Tuberculosis kills more young people and adults than any other infectious disease in the world.

According to a report by the World Health Organization that appeared in the March 1998 issue of FDI World, it is a bigger killer than malaria and AIDS combined and kills 100,000 children each year.

Like the common cold, TB spreads through the air, and to become infected, a person needs only to inhale TB bacilli that become airborne when an infected person sneezes, coughs, spits or talks.

This year, more people will die of TB than in any other year, according to the FDI World story. New outbreaks are occurring in Eastern Europe, where TB deaths are increasing after almost 40 years of steady decline. Southeast Asia has the largest number of cases with nearly 3 million per year.

HIV and TB form a lethal combination, each speeding the other's progress. One-third of the increase in the incidence of TB in the last five years can be attributed to HIV. Of the nearly 31 million people worldwide who were HIV-positive in 1997, about one-third were believed to be infected with TB.

Until 50 years ago, there were no medicines to cure TB. Strains that are resistant to a single drug or even a combination of drugs have now emerged. Multidrug-resistant (MDR) TB is caused by inconsistent or partial treatment, the wrong drugs or the wrong combination of drugs, or an unreliable drug supply.

Poorly supervised and incomplete treatment of TB can be worse than no treatment at all. If someone with MDR-TB infects another, the newly infected person will have the same drug-resistant strain. Drug-resistant TB is more difficult and more expensive to treat, and more likely to be fatal.

In the US, one-third of TB cases are among foreign-born people. Untreated TB spreads quickly in crowded refugee camps and shelters. Homeless people in industrialized countries are also at risk. In 1995, almost 30 percent of San Francisco's homeless population was reported to be infected with TB.

The World Health Organization recommends a treatment strategy for detection and cure of TB called DOTS (Directly Observed Treatment, Short-course). DOTS combines five elements: political commitment, microscopy services, drug supplies, monitoring systems and direct observation of treatment.

DOTS produces cure rates of up to 95 percent, even in the poorest countries, and prevents new infections and the development of MDR-TB. A six-month supply of drugs for DOTS costs $11 per patient in many parts of the world.

In the few years since DOTS was introduced on a global scale, more than 1.7 million infectious patients have received effective DOTS treatment. In spite of this rapid progress, only 12 percent of estimated TB patients received DOTS in 1996. At the beginning of 1997, 95 out of 212 countries had adopted the DOTS strategy. Of those, 63 have implemented DOTS countrywide.

If the WHO goals of detecting 70 percent and curing 85 percent of new infectious TB cases are met by 2010, one-quarter of TB cases and one-quarter of TB deaths could be prevented in the next two decades.

DOTS

Directly Observed – It is the responsibility of the health worker, not the patient, to ensure that powerful anti-TB medicines are used properly. That is why patients must be observed swallowing their medicines, especially during the first months while they still are seriously ill and at risk of developing drug resistance.

Treatment – The objective of treatment is to cure the patient. To accomplish that, health workers must do more than pass out medicines. In the case of contagious patients, sputum must be examined under a microscope after two months and at the end of treatment to help ensure that each patient will not relapse again with TB.

Short-Course – The correct combination of anti-TB medicines must be used for the right length of time.

Source: WHO fact sheet number 104, February 1998.

Generosity With a Practical Twist

By Marios P. Gregoriou

Generosity and philanthropic motives are important factors behind most charitable giving.

However, they often are not the only factors.

Many investors also may be motivated by the significant tax, investment and estate planning advantages associated with the making of charitable gifts through a charitable remainder trust (CRT).

If you are an investor in your 50s or older, or are nearing or are in retirement, and if you own highly appreciated

securities, you may wish to consider a CRT to take advantage of the tax benefits provided by such a trust. Through a CRT, you may receive:

- Relief from capital gains taxes on the sale of contributed assets.
- An income stream for the rest of your (and your spouse's) life.
- A current-year income tax deduction.
- The potential to reduce estate taxes.
- The ability to diversify your investment portfolio.
- The personal satisfaction that comes from supporting a favorite charity.

How a CRT Works

A CRT is created to provide lifetime or term income payments to you, and/or family members, while the remainder eventually is payable to a qualified charitable organization.

Your payments, subject to income tax, may be an annual fixed dollar amount (an annuity trust) that is equal to a percentage of the trust's initial value. Or, they may be variable annual payments (a unitrust) equal to a percentage of the value of the trust fund. In that case, the fund is revalued each year.

Because a CRT is tax-exempt, appreciated assets transferred by you to the trust may be sold by the trustee free of capital gains taxes. Assets in the trust may then be reinvested in a high-quality diversified portfolio which can potentially generate increased income.

Another benefit a CRT can provide is a charitable income tax deduction in the year you fund your trust. Keep in mind that your deduction will be less than the total value of the trust assets if you or other beneficiaries are to receive payments from the trust.

An additional tax advantage provided by a CRT is that assets transferred to the trust will not be counted as part of your estate. That helps to reduce the value of your estate, which could reduce potential future estate taxes. Federal and state estate taxes range between 37 percent and 55 percent on taxable estates valued at $625,000 or more (for 1998).

Wealth Replacement

Many individuals who are interested in establishing a charitable remainder trust ask about leaving assets to their heirs.

While assets in the charitable remainder trust must go to the charity upon the death of the surviving beneficiary, the increased cash flow and tax savings that result from the trust may be used to purchase life insurance in an irrevocable life insurance trust. With a properly structured life insurance trust, (1) premiums are paid with dollars that would have gone to taxes, (2) proceeds are outside the estate and are not subject to estate or inheritance taxes, and (3) proceeds are received by your beneficiaries income tax-free.

Keep in mind that a CRT is irrevocable. Assets in the trust eventually will go to your designated charity. Consult your tax and legal advisers to be sure a charitable remainder trust fits into your overall estate plan. If it does, you may enjoy significant tax, investment and financial benefits as well as leave a lasting legacy to your favorite charity.

Mr. Gregoriou is associate vice president and financial adviser for Morgan Stanley Dean Witter in Sacramento. He can be reached at (800) 755-8041. This article does not constitute tax or legal advice. Consult a tax adviser and attorney before making tax- or legal-related investment decisions.

Why is That Investor Smiling?

Dental companies touting the next great idea only to see their stocks tumble as the claims don't pan out as expected have taken some hits lately. However, there are dental stocks with real track records that match the steady path of the profession.

According to the federal Health Care Financing Administration, $45.8 billion was spent in 1996 on dental office supplies and services, an annual growth of 7.7 percent since 1990. Projections indicate that demographic trends such as an aging population and increasing demand for cosmetic work and preventive care will drive up industry revenue 5.6 percent a year through 2001.

Some companies are poised to grow even faster than that, with accelerating consolidation fueling double-digit revenue and earnings growth. A handful of dental product and equipment makers are buying smaller competitors; the resulting economics of scale provide some compelling margin expansion. Distributors of those products are joining forces to gain bargaining power with manufacturers.

The stocks to watch are those companies which show sound management fundamentals and strong growth projections. It's the long-range, steady growth of many dental companies that make investors take a look, and when they see the earnings, they smile.

Sit Up Straight

"How many of us deliver care year in and year out while seated with rounded backs and heads down and forward?" asks Steven Fong, DDS, in the May edition of the Southern Alameda County Dental Society Explorer.

Fong says dentists should consider that, while they preach prevention of disease and the penalties for neglect, they often are guilty of not applying those principles to their own need for good posture.

Good posture protects the supporting structures of the body against injury or progressive deformity. The health of thoracic

and abdominal organs is optimized under conditions of good posture. Good posture creates alignment and balance whether in rest or in motion, says Fong. It allows movements to be made in proper patterns which denote power and athleticism.

And, says Fong, good posture is sexy.

Improper sitting position involves slumped shoulders, rounded back, head forward and lumbar spine exhibiting a backward curve. In this position, scapular joint alignment is offset, resulting in the inability to make effective arm movements. Too much load is placed on the facets of the cervical vertebrae, leading to neck soreness. Breathing is impeded, causing poor oxygenation. Prolonged slumping can lead to musculoskeletal conditions such as disk protrusions, muscle imbalance, spasms, pinched nerves, and weakening caused by muscle shortening – definitely not sexy.

In the days of stand-up practitioners, dentists could be identified by their sideways deflected backs. Even in today's sit-down dental practice, says Fong, posture is often compromised. Poor posture can result from the difficulties inherent in the visualization of the oral cavity. The use of abundant lighting, optical magnification, rubber dams, indirect mirror techniques and particularly video imaging can help overcome those vision problems, allowing maintenance of good posture.

Proper posture in standing and walking is an extension of proper sitting posture. No matter what a person's age, good posture can become a habit that enhances one's future quality of life, says Fong.

Web Sites 101

Not too long ago, if someone was talking about "the web," the first thing that came to mind was an ugly black spider. Then came the scramble to "get on the 'net" and investigate all the hoopla. Many people built their own web sites, sure that the marketing advantages would catapult their earnings into the stratosphere.

Some of those people have become disappointed because their web site doesn't seem to do anything and their initial investment is not bearing fruit.

So, how does one build a web site that can attract visitors and, even better, get them to return? How is value built into the site? What is it that people want in a web site?

A good web site for a dental practice will provide general information about the dentist and staff. With the ability to be updated quickly and inexpensively, a web site can introduce a prospective patient to the "feel" of the office and even offer virtual tours of the provider's facilities and other information that cannot be included in traditional printed materials. Web sites can be static or interactive, simple or complex, stand-alone or part of a web community.

It's a good idea to develop a strategic plan for a web site. The plan should encompass these three areas:

- What do you hope to accomplish with an Internet presence?
- What is the target audience, or who do you want visiting the site?
- What do you want people to do once they visit the site?

People will only visit a web site if it provides value. Identify the level of web site sophistication desired. Create links to other appropriate sites. Build in e-mail capabilities. Include information about the dentists and staff, including credentials, office philosophy, location, hours, and how a patient can contact the office. Above all, present a consistent message.

There are many resources, software and connection companies available to assist in the web site building process. Once the site is in place, remember to add web site and e-mail addresses to business cards and invoices.

Periodontitis Presents Pregnancy Risks

Recent research has suggested a relationship between periodontal disease and a serious complication of pregnancy, says Timothy J. McNamara, DDS, in the May 1998 issue of WDA News. He writes that women with severe periodontitis have more than seven times the risk for preterm, low-birth-weight delivery than women without severe periodontitis, even after adjusting for all other known risk factors.

Preterm, low-birth-weight (PLBW) deliveries account for 10 percent (250,000) of all U.S. births and more than 60 percent of infant mortality, excluding congenital anatomic or chromosomal defects. PLBW is responsible for 5 million neonatal intensive care unit days per year, with an annual cost of $5 billion per year.

There are many recognized risk factors for PLBW: maternal age under 17 or over 34; African-American race; low socioeconomic status; inadequate prenatal care; alcohol, tobacco, or illicit drug use; hypertension; genitourinary tract infection; diabetes; and multiple pregnancies. About 25 percent of PLBW cases occur in the absence of any known risk factors. Studies have revealed that mothers with periodontal disease have a greater than seven-fold risk of PLBW after adjusting for all known risk factors.

McNamara says it long has been known that women are more susceptible to periodic periodontal inflammation, especially gingivitis, as a result of normal fluctuations of hormonal cycles and that pregnant women experience marked progression of periodontal disease during pregnancy. Pregnant women can expect no periodontal inflammation or other symptoms if they enter pregnancy free of periodontal disease, practice good oral hygiene and

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maintain regular professional care.

"We just now are recognizing a greater health risk for pregnant women with periodontitis," he concludes.

The ABCs of Vitamin D

Researchers believe that Americans – especially those who are older – are not always getting the vitamin D they need, exposing themselves to osteoporosis or thinning of the bones.

Vitamin D is made by the skin when it is exposed to sunlight and also is found in foods such as sardines, salmon and fortified milk. The nutrient makes calcium and phosphorus more available for bone mineralization. However, while calcium has received plenty of media attention recently, vitamin D has become a poor stepsister, even though many researchers believe it is just as important as calcium. In fact, the body cannot absorb sufficient amounts of calcium without vitamin D.

People who have low blood levels of vitamin D are at an increased risk for fractures associated with osteoporosis and osteomalacia, softening of the bones. Vitamin D also is needed to maintain strong, disease-resistant teeth as well as keep jawbones that hold the teeth strong and healthy.

Older adults are more likely to be deficient in vitamin D because the body's mechanism for producing the nutrient from sunlight declines with age. In addition, older people often don't get outdoors. Because vitamin D is stored in fat, younger and middle-age adults, who often get outdoors more frequently, usually can rely on reserves built up during summer months to get through the winter.

Last year, the National Academy of Sciences increased the Dietary Reference Intake for vitamin D from 200 International Units (IU) to 400 IU for people aged 51-70 and 600 IU for those 70 and older. However, a recent study suggests that those levels still could be too low because vitamin D deficiency appears to be more prevalent than previously thought.

Milk fortified with vitamin D does not always contain consistent amounts of the vitamin. A study conducted by Boston University researchers, published in the New England Journal of Medicine in the early 1990s, indicated that half of the milk samples they tested contained 50 percent or less of the government-required 400 IU of vitamin D per quart. Also, people may mistakenly believe that other dairy products such as yogurt, ice cream and cheese are fortified with vitamin D when none of them are.

Good Call

The next time the phone rings in your office, you may want to pay attention to how your staff answers it.

Patients' first impressions help them form their perception of the quality of your practice and the care they receive.

When was the last time you heard a patient say "The margin on the lingual of that crown is perfect"? According to the Academy of General Dentistry, the way in which the telephone is answered and the subsequent conversation tell the caller a great deal about your practice.

That is especially true for first-time callers. They have not had the opportunity to visit the office to evaluate your practice. If the voice on the telephone and the language used is not that of caring, warmth and concern, your potential new patient, who may be anxious already, may be turned off to you and your practice.

Following are a few telephone tips which will be help callers recognize an office that is organized and practices good communication:

- Select a standard phrase that everyone uses when answering the phone.
- Always be courteous and pleasant. Good manners are essential to good business. There is a huge difference between the phone being answered, "Dental office, hold please," and "Good morning, Dr. Scott's office, this is Kathy speaking, how may I help you?"
- Delegate one person to answer the telephone and one person to serve as backup. Rotate the assignment as necessary for different days of the week.
- Use a telephone message slip to record the date, caller and reason for the call. Use a message slip instead of a sticky note or scrap paper because it's more difficult to lose.
- It is very important for incoming calls to be screened. Make a rule to avoid interruption when seeing patients unless there is an emergency, another dentist is calling about a patient in the chair, or it's an expected call.

Overall, good telephone management prevents many unnecessary interruptions to patient care and helps build your communication with patients.

Honors

John S. Sottosanti, DDS, a private periodontal practitioner from La Jolla, Calif., has been awarded a Special Citation in recognition of outstanding contributions to the American Academy of Periodontology.

Mark Lisagor, DDS, of Camarillo, Calif., and Neil Silverman, DDS, of Santa Rosa, Calif., received Certificates of Recognition for Volunteer Service in a Foreign Country from the Council on ADA Sessions and International Programs.

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Quackery in Dentistry – Past and Present

Malvin E. Ring, DDS

ABSTRACT Quackery in dentistry has been a problem as far back as the earliest days when sufferers from dental ills sought relief from their aches at the hands of some type of practitioner. Some were genuine, some were quacks. Following is a historical perspective of quackery.

AUTHOR

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Frequently a quack can be a self-styled expert, making himself out to be the director or president of an important-sounding – even if non-existent – scientific society. Like the plaque that proclaims World's Greatest Cook, taking a title for oneself is, on its own, not illegal. The use of that title to defraud others is.[1] But what impels quackery? It results when competent and trained practitioners are in short supply or when their charges appear prohibitive to a segment of the population. Then untrained individuals step in to supply a genuine need. But the quack differs from the ethical practitioner in that the quack's basic tools are incompetence and fraud. A study of medical quackery in the 1930s found that the charlatan achieves his great power by simply opening a possibility for men to believe what they already want to believe.[2] Then the half-educated become the eagerly gullible prey of the quack, and their number at times becomes indeed a majority.

Colonial America

Little was done in colonial times to curb fraudulent practice. In 1649, the colony of Massachusetts enacted a law requiring surgeons, midwives and physicians to act in accordance with what were then understood to be the approved "Rules of Art". But it set up no educational or licensing provisions. Medical legislation in the Virginia colony was aimed more at medical practitioners "excessive rates and prices" than at their skill. Under a law of 1645 a physician might be arrested for unreasonable charges, but not for worthless treatment and quackery.[3]

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Folk medicine

Although not truly quackery, many home remedies and treatments seldom cured toothache or relieved the anguish of oral disease. The person who suggested or carried out these "remedies", in contrast to the quack, did not do so out of a profit motive, but from a sincere desire to help. Nevertheless, it is interesting to note only a few of these curious procedures. The numbers of these "cures" are legion!

Figure 1

The Amish relied on a special "Toothache Pillow" to assuage the torment. It was a small pillow, generally filled with some aromatic herbs, upon which the sufferer would lay his head. The promise was that the toothache would be gone on the morrow. (**Figure 1**)

In early America, and up until modern times, most people relied on self-dosing. Numerous concoctions were recommended in countless almanacs, cook books and books of self-treatment. A typical remedy: "Ground chestnut, mixed with mutton tallow is said to be good for toothache – if you have nothing better... Dried hops, placed in a small bag and held against the jaw is another remedy.[4]

Figure 2

Touching an aching tooth with a common nail – or what was claimed to be even better, a horseshoe nail – and then pounding that nail into a live tree was widely practiced in Europe. But these fanciful practices varied from country to country. Norwegian tradition, for example, holds that there are nine kinds of toothache, and the Norwegians handle different toothaches differently. The carious lesion is pricked with sharpened sticks of hardwood from nine different varieties of trees until blood is drawn. Then the sticks are hidden in a place where they would never be found, or sometimes are driven into a tree.[5]

Non-Dentist Quackery

The most common form of dental quackery was that which was foisted on a gullible public at country fairs, carnivals and on public streets. One of the most blatant was an Italian quack pictured in a spectacular painting of around 1850 titled "Cacciamole in Carnevale" (The Hunter of the Tormentor, the "tormentor" being the aching tooth.). Here the quack not only sought and removed the aching tooth – from what was obviously his accomplice – but flourishes his "trophy", a huge jawbone with teeth embedded! (**Figure 2**)

Figure 3

More truthful and typical of the charlatans ministrations is an illustration which appeared in a London newspaper of 1872. It shows a quack in Italy extracting a tooth from a struggling unfortunate, while a band plays loudly behind him, as much to attract attention as to drown out the cries of the victim. The inscription above a painting in the background touts the quack's herbs to counteract woes and to conserve the teeth. (**Figure 3**)

Figure 4

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Charlatans plying their trade in the streets were not limited to Europe. The popular magazine Scribner's Monthly ran a series of illustrations in the 1870s entitled "The Street Venders of New York." The December 1870 illustration pictured a quack pushing the sale of his "special" dentifrice. He holds a street urchin's nose with one hand while vigorously scouring the child's teeth with the other, all the while loudly proclaiming the virtues of his marvelous concoction. (**Figure 4**)

But this type of quackery is insignificant when compared with the description of a charlatan at work in the streets of England in 1860:

A quack makes a mixture of acids and other vile stuffs which he colors or perfumes, then dons the dress of a knight or prince, and with an attendant, mounts an attractive and somewhat mysterious looking carriage, drawn by two or sometimes four richly caparisoned horses, and drives into the public squares. He then harangues the crowd on the virtues of his vitriol which he calls "Elixir of Life" and which he avers will cure all the maladies of the gums and in a twinkling give the teeth a durable whiteness unequaled by a row of pearls. This does not fail to bring an accomplice before him who complains bitterly of pain is several of his grinders.

The multitude look on in wonder to see the magic effect of his remedies...A few flourishes by an attendant on a drum, and the sufferer (?) declares himself free from pain and opens his mouth to the gaping crowd to show how quick his teeth have been made white as snow. A burst of enthusiasm drowns the thunderous noise of the drum, and hundreds of bottles of elixir are instantly sold.[6]

But there was always danger to the patient from untrained personnel, and this can be well illustrated by a case that was described in a book by an English dentist. He recounted the sad tale of a Baroness, who, being troubled with a toothache, was assured that her local blacksmith was adept at pulling teeth. In this book, published in 1862, the author tells how the blacksmith "pulled out a dirty handkerchief, with which to lap round the key tooth, an instrument of his own forging...and with some difficulty and force, managed to extract the vicious molar." Unfortunately, his key "formed better to remove a granite boulder than a human tooth...fractured the Baroness's alveolary process and a portion of the jaw bone. Her Ladyship for the rest of her days, concealed in her mouth, the reminiscence of a blacksmith's skill in tooth drawing."[7] What is shocking is that results like this were happening by the thousands in this country as well as abroad.

A startling aspect of medical quackery is that practiced by the religious evangelist, and there are evangelists who find dentistry, in particular, an irresistible source of income. In November, 1986, a Rev. Willard Fuller visited Rochester, New York. Mr. Fuller was a former Baptist minister who parted ways with the denomination because it did not subscribe to faith healing. The Reverend warmed up the crowd by claiming that at a previous ministry in Phoenix, after "the laying on of hands," an 11-year old girl with six filled teeth suddenly had whole teeth and no fillings! He told of another woman in upstate New York whose teeth had all been previously extracted. After he "touched" her, she grew a new set of teeth! He also claimed that he changed silver fillings into gold, and at the Rochester meeting, he claimed to have changed a silver-colored crown into gold by touching it. The director of the Committee for the Scientific Investigation of Claims of the Paranormal was at the meeting and asked for some people present to examine those who claimed that changes had taken place, to see whether there actually were changes. There were no takers! The charge to the believers to attend the meeting was $10 in advance and $12 at the door. The Syracuse (N.Y.) Post-Standard of about the same time reported that Fuller claimed to have "witnessed some 35,000 miracles in the mouth, with an average of about 1,500 healings a year."[8]

Magnetism, Electricity and Quackery

Figure 5

The experiments with electricity by Benjamin Franklin and others, in the late 18th Century, gave impetus to trials using all forms of hitherto poorly understood forces. Anton Mesmer's theory of "animal magnetism" was sweeping the world and bold physicians were attempting its use in assuaging pain. Mesmer himself became so popular that he claimed to be able to "mesmerize" patients by remote control through the medium of "magnetized" objects.

A quack in Connecticut, Elisha Perkins, entered the field in 1798 with his patented "Electric Tractors." This was a forked contrivance, one end sharp and one blunt, most commonly made of combinations of copper, zinc and gold. He claimed to effect cures of innumerable diseases – including toothache – by stroking the affected part, the "curative" power, he claimed, being due to an action

similar to Mesmer's "animal magnetism". His nostrum swept not only the U. S. but much of Europe and it was not discredited until an English physician showed that the same "cure" could be effected by stroking the patient with a wooden fork, gilded to resemble metal. (**Figure 5**)

Other quacks capitalized on this new found magnetic force. A Scottish quack, James Graham, built a colossal Temple of Health, whose main attraction was a huge Celestial Bed, supported on forty "magnetized" pillars. A night spent in the bed, with accompanying soft music and scantily clad exotic dancers, Graham claimed, would rejuvenate the most senescent of men, at a cost of a mere 100 Pounds a night! [9]

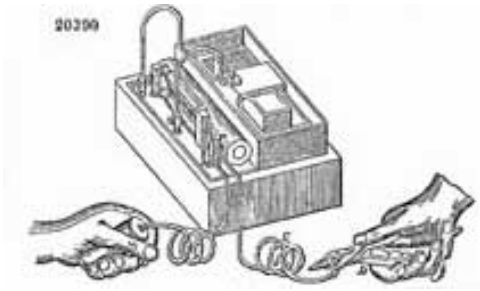


Figure 6

The novelty of electricity led to its being tried as an anesthetic in tooth extractions. A report in a dental journal of 1858 10 described a process being used in Baltimore where a current of electricity was passed through the tooth at the time of extracting. Its mode of use was described as follows: "The patient grasps firmly in his hand one pole from an electro-magnetic machine, the other pole is attached to the forceps, and by this means a current of electricity is passed through the tooth, and produces a local anesthesia, and so avoids the use of chloroform or ether." (**Figure 6**) Unfortunately, carefully controlled studies some years later showed there to be no anesthetic effect whatsoever in this method. In fact, a dentist of 1860 had a woman patient who was desirous of having a tooth extracted by electricity. His battery had run dry, but he nevertheless had her hold the electrodes – even though he passed no electricity through them – while he extracted the tooth. She then "threw down the rod and jumped out of the chair perfectly delighted, saying it did not hurt her a bit!"[11]

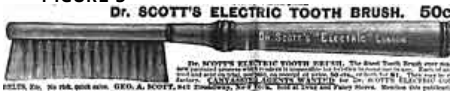
Figure 7

In the mid-1850s an enterprising company, Davis and Kidder, brought out its "Patent Magneto-Electric Machine". (**Figure 7**) It was a simple generator, current being produced by the turning of a crank handle, the amount of current being determined by the speed of cranking. The patient held one electrode, the operator the other. The accompanying instructions for treating toothache instructed the operator to hold an electrode in one hand, and with the other hold a wet sponge to the face, in the area of the aching tooth, while the patient holds the other electrode. An assistant then cranks away, ostensibly making the toothache disappear. Lack of success soon made the machine a relic, to be consigned, one would think to oblivion. However, quackery is ever present, because around 1920 an enterprising entrepreneur resurrected it and renamed it the Electraply.

Figure 8

It was powered by one D-cell battery, and the manufacturer touted that "electro-therapeutic treatments may be had inexpensively and effectively in your own home by applying the Electraply." (**Figure 8**) In addition to treating toothache, the manufacturer claimed it would cure poor circulation, headache, neuralgia, neuritis, tonsillitis, catarrh, asthma, goiter, hoarseness, earache, lumbago, backache, dandruff, falling hair, paralysis, nervousness and sexual weakness, to name but a few of the recommended uses! [12]

Figure 9



The electricity craze reached such extremes that an "electric toothbrush" manufactured by the Pall Mall Electric Association of London was imported to the United States in the 1880s and sold for 50 cents. It came with a special cloth, which when rubbed on the handle was supposed to impart special electrical qualities to the brush which extended the life of the teeth. This even though the handle was of ordinary hardwood! (**Figure 9**)

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Patent Medicines And Other Worthless Devices

Patent medicines and similar nostrums had flooded the country to such a degree that the health and well-being of the population was threatened. In response to flagrant abuses, Congress passed, and on June 30, 1906, President Theodore Roosevelt signed, into law the first Food and Drug Act. This required that patent medicines list their ingredients on the label. And although narcotics were not banned from syrups given to babies, it was assumed that by means of education, mothers would be less likely to use them. Samuel Hopkins Adams quotes a conversation between an office scrub-woman and the lawyer she worked for: "How can you go to these evening parties, Nora, when you have two young children at home?" "Sure, they're all right," she returned blithely, just one teaspoonful of Winslow's and they lay like dead till morning."[13]

Figure 10

Mrs. Winslow's Syrup had indeed been a wide seller. Its manufacturer touted it as having been used by mothers for children teething for over 50 years with perfect success. It relieves the sufferers at once, produces natural, quiet sleep by freeing the child from pain, and the little cherub awakes "bright as a button." It is little wonder that the child was effectively silenced. The syrupy nostrum contained almost 30 percent opium and morphine in alcohol![14] (**Figure 10**)

Figure 11

In addition to the quack electrical machines which were discussed earlier, other devices were peddled to the populace, the rationale for them being based on totally false premises. From ancient times, man has explained the source of the gnawing pain of toothache as the burrowing of a "tooth-worm" in a carious tooth. Various means were employed either to lure the "worm" out of the tooth by bait, such as honey, smeared on the outside of the tooth, or to kill the "worm" with smoke from burning seeds of henbane or leek. And because people have frequently been fearful of dental treatment, such painless quack treatments have been attractive through the years. An advertisement in an English newspaper of 1837, claiming to cure tooth-ache by fumigation is evidence that quack devices are hard to get rid of, and are a quack's easy sell. (**Figure 11**)

Quackery Within the Profession

There is a long history of flamboyant practitioners in the dental profession, stretching back to the 1600s. One of the most notorious was Le Grand Thomas, a giant of a man, bedecked with a plumed hat and flowing garments, who carried on his activities in the 1720s in the middle of Le Pont Neuf in Paris. He sat on a high platform while his assistants probed the mouths of waiting sufferers; then, from on high, he would give his opinion as to the desired treatment and its fee.

England had its share of flamboyance among dental practitioners, the most notable one being Martin van Butchell. He rode through the streets of London in a golden coach, driven by two gorgeously caparisoned coachmen. Walking before the coach, similarly attired, were two footmen blowing golden trumpets, announcing that the great doctor was driving by. Van Butchell had let it be known that his fees were the highest of any of the dentists of London, and thus he attracted to himself the very cream of society, and peers and nobles fought to be his patients.

A short time later there appeared in London another quack who quickly became the most notorious of all. He was known only as M. Patence. His flamboyant newspaper advertisements touted his supposed expertise, and he achieved notoriety in spite of his lack of training. An idea of his "bamboozling" technique can be gleaned from a book he published in 1774. In it he describes the actions of the mandible. Can one gain head or tail from it?

If we consider the six-fold action of the jaw, it excels all mechanical motions whatever: all the parts move from the centrical points, except the compound rivet, which few understand; the rest terminate in angle from the centre, but this when it opens moves quite different; its actions are horizontal, vertical, forward, backward, extends behind or shuts before: for when the grinders meet, the upper fore-teeth project over the lower, and when the fore-teeth are employed in eating, there is an open space betwixt the grinders; so that the rest is given alternatively throughout the whole, the methods of which no mechanic can comprehend, there being no screw, or constructed lever, to alter the

wonderful operation of such an amazing construction.[15]

It was because for so long there was no adequate educational system for the training of dentists that unskilled practitioners held sway. Even many years after the establishment of the first dental school in the world at Baltimore in 1840, most dentists still received their training by the preceptoral method. The student would be associated with an established dentist for a period of one to two years, and generally became a proficient practitioner. The teacher would receive a fee, in a manner similar to that of master and apprentice. But there were unscrupulous individuals who took in students merely for the money and turned out miserably unqualified operators to prey on an unsuspecting public. This was of such moment that the first dental journal editorialized "We know of one who has the unblushing effrontery to promise to fit them for the profession in one month – to teach them the whole art and science of dentism, both surgical and mechanical, in 26 days; and this, not requiring their constant attendance, but two hours twice or three times a week."[16]

In some cases the quackery was simple out-and-out thievery. A case was reported in 1844 of a couple who chanced to stop in Boston on their travels. The lady was in need of a new upper denture, her existing gold upper not fitting her well. They saw an advertisement of a dentist who offered the needed treatment and, after consultation, agreed to pay him a liberal amount in cash plus her old gold denture for the new set of "mineral teeth on gold." The work was accordingly completed and the couple went on their way, but when they reached Portsmouth, Maine, one of the teeth came off the denture. They stopped at a local dentist to have it resoldered and discovered to their dismay, that when the repair was undertaken, the metal proved to be not gold, but silver gilded over so as to look like gold![17]

In some cases quackery by dentists took bizarre forms, such as a licensed practitioner conniving to let an unlicensed person treat his patients for a fee. This was a frequent occurrence in England in the last century and even into the early years of this one. A case was brought to court in Cardiff, Wales, in 1898 by a woman who described the actions of just such a quack who looked at her mouth, pronounced it in very bad shape, and said he would "...cut the teeth off and fit new ones on the top." He then "cut away all the top teeth except one, and all the other stumps he snapped off with something like a pincers, the bits flying all over the room." He then immediately took some sort of impression and the next day inserted a denture. The patient, being in great distress, sought out a licensed dentist who found her mouth in a deplorable state, with lacerated and inflamed gums, pus oozing freely everywhere. This dentist testified that he ultimately extracted twenty-two roots for the patient, declaring in court that the previous treatment rendered her by the unlicensed person was exceedingly improper. Monetary judgment, plus court costs, was awarded to the plaintiff.[18]

A New Type of Quackery Today

With the increasing popularity of "alternative medicine," a number of dentists have seen an opportunity to garner a great deal of wealth by trading on patients' fears. Thus, there are some who advocate the wholesale removal of amalgam fillings and their replacement with composites, even though scientific studies have shown that there is no danger to the patient from the amalgams. Some have gone even further, and have taken a page from the practice of many chiropractors. They are no longer "tooth oriented" but attend rather to the "wellness" of their patients. A representative of the Shaklee vitamin company reported that some dentists increased their annual gross by $50,000 by having a dental assistant, with no nutritional training, counsel patients on dietary supplementation, dispensing these supplements at a hefty charge![19]

Fortunately, these unscrupulous individuals are not always getting off scot-free. In 1990, a dentist licensed to practice in New York State, charged with nine counts of "unprofessional conduct" had his license revoked.[20] Among the complaints was the fact that he urged a patient, who complained of arm and leg pain, to have her amalgam fillings removed, going so far as to tell her that when she chewed food she was poisoning herself, because the mercury in her fillings was toxic and was being released in small doses. And when she later complained of a sore throat, he urged her to take "detoxifying agents" to get rid of the mercury in the tissues of her mouth.

Dentistry has come a long way in the last century and a half, to the point where today it is ranked as one of the most respected of professions. It is incumbent upon dentists everywhere to protect that hard-earned reputation by weeding out quacks from among them, and to consign to the dust-bin of history the shady and nefarious practices of the past.

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CDA JOURNAL, VOL 26, Nº11

Controversies in TMD

Greg Goddard, DDS

ABSTRACT Health professionals have dealt with temporomandibular disorders, a major cause of non-dental pain in the orofacial region, by developing a broad range of treatments, ranging from occlusal alteration to multidisciplinary self-care regimens. Research directed toward evaluation of various TMD treatment modalities is particularly controversial due to cyclical fluctuation of symptoms, high rates of spontaneous remission, and possibility of placebo effect interference. Given this variety of treatments now current, dental professionals bear a broadening responsibility to review and assess the range of diagnostic possibilities and treatment potentials now entering into the scientific literature.

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Currently, the health professions have many different approaches to consider in the treatment of patients suffering from temporomandibular disorders. This paper reviews and discusses some of these approaches – and some of the c ontroversies aroused by them – in the hope that the dental profession will soon arrive at more effective, scientifically based treatments.

Temporomandibular Disorders denote a group of related disorders of the TM joint and/or the associated musculature. Some of the more common TMD diagnoses are TMJ inflammation, TMJ anterior displaced disc with and without reduction, and myofascial pain. These conditions may have multiple causative factors, often without a clear understanding of what the exact causes are. TMD can have a variety of signs and symptoms, including but not limited to pain in the jaw joint or face, headaches, earaches, dizziness, enlarged masticatory muscles, limited mouth opening, and noises in the jaw joints. Temporomandibular disorders are a major cause of non-dental pain in the orofacial region.[1]

It is with this background that health practitioners have responded to their patients' needs by developing a broad range of treatments, often determined more by the specialty of the practitioner than by scientifically-based treatment. There are practitioners claiming successful outcomes from a diverse number of treatments ranging from education and behavioral counseling, use of medications, occlusal therapies, surgery and splints, to a combination of various treatments.

Much of this information is anecdotal.[2-9]

Historically, treatment for TMD was based on an assumption that occlusion was the primary cause of this problem. Treatment was often focused on altering the patient's occlusion. Treatment included splints, equilibration, reconstruction of the occlusion with orthodontics, surgery, and restorative therapy.[10] As more research was published, diagnosis progressed to differentiating between subsets of both joint (TMJ) and muscle conditions. Treatment altered specific to the etiology of the problem.[11,12]

The medical profession went through a similar evolution with the diagnosis and treatment of low back pain. Medical management went from performing surgery on "ruptured discs" to a more conservative approach of managing low back pain with self-care; anti-inflammatory medications, muscle relaxants, physical therapy, and exercise.[13] It was also recognized that low back pain, especially if it was chronic, had to include psychological evaluation and management because stress and somatization may play significant roles.[14,15] As a result, the multidisciplinary approach to treatment of chronic low back pain emerged. Self-care became an integral component in this approach. The goals of this approach are to educate the patient to learn to manage their problem through understanding and use of proper posture and body mechanics, exercise, weight control, stress management, and the use of over-the-counter medications. 14,15 This approach is now accepted in the medical profession and is well-supported by research.[16,17]

Today TMD may be approached in a manner similar to low back pain, i.e., using a multidisciplinary approach to treatment.[18-20] Treatment can include many of the same therapies included in the medical approach to low back pain; self-care, anti-inflammatory medication, muscle relaxants, physical therapy and exercise.[20-22] The clinical use of non-invasive therapy that includes the use of splints, prescription medications, biofeedback, psychological counseling, as well as self-care techniques, is well-documented.[22-25]

In the field of TMD, self-care has been mentioned in several citations as an important part of treatment.[11,20,21] Recently de Leeuw et al.26 published a 30-year long-term follow-up of 99 TMD patients (with disc displacement) treated with mostly self-care techniques of reassurance, exercises, and superficial heat. Satisfaction with the treatment outcome was high. Also Toller 27 found that simple reassurance and explanation produced improvement in over 80 percent of the TMD patients within three months. Cognitive behavioral (CB) treatment has been shown to improve long-term outcomes for TMD patients.[28,29] Also, minimal interventions have been used for the management of other chronic pain conditions. Minimal interventions use information and education in the form of self-care materials coupled with brief professional guidance at critical points and low-cost methods for patient follow-up, such as brief telephone counseling. Most relevant to TMD, a series of studies has shown minimal CB interventions for headache to be effective.[30-32] There are three books written for patients with self-care recommendations for TMD.[33-35] There is a need for research into the effect of self-care on TMD pain that meets today's scientific standards.

Research involving TMD treatment modalities is suspect because few research projects have been properly controlled and blinded or use reliable and valid outcome measures.[14,35,36] Most of the research showing the high rate of clinical success in TMD therapy has evaluated splints, either used alone or in combination with other therapies.[37-45] However, many of these reports did not follow procedures that are now considered to be essential in clinical trials.[46-47] The most important of these are: the inclusion of a control group, randomization, use of reliable outcome variables and measurement methods, data collection and analysis under blind conditions, and adequate study sample size. The true therapeutic value of the different treatment modalities has not been established beyond doubt. The inclusion of an appropriate control group is particularly important in TMD research, because it has been reported that the symptoms fluctuate cyclically, that there is a high rate of spontaneous remission, and that the placebo effect may account for a great part of the patient's relief.[38,48] The collection of the data and their analysis under blind conditions are critical procedures that limit bias.[49] Unfortunately this method has not been followed in most studies.[35]

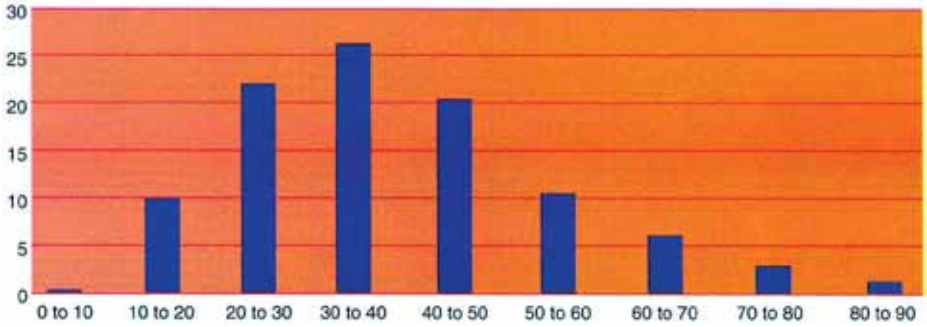
Epidemiology

The epidemiological data for TMD reveals that even though large percentages of the population have signs or symptoms, only an estimated 3.6 percent to 7.0 percent are considered to have a problem that is serious enough to warrant treatment.[50-56] Most studies show that 60 percent - 80 percent of those presenting for treatment are women, and most of these are between 20 and 50 years of age.

Some practitioners argue that early treatment is necessary to prevent minor problems from getting worse. The literature on the natural history of TMD suggests that TMD is not usually a progressive disease. It is often remitting, self-limiting, or fluctuating over time.[20,57] A recent study followed a group of TMD patients that

TABLE 1.

Prevalence of age groups in sample of 1505 patients seeking TMD treatment at University of California, San Francisco, Center for TMD and Orofacial Pain between 1993 and 1995.



had been treated with conservative, non-invasive therapy, and after 30 years most of them had become asymptomatic.[57] This suggests that TMD is often self-limiting, and does not necessarily progress to chronic and disabling intracapsular TMJ disease.[57] Also, the fact that most TMD patients are between 30 and 50 years of age suggests that TMD is not a progressive disease but is self-limiting, and much less of a problem in the 50-and-over age group (**Table 1**).[58-64] If it were a progressive disease, we would see more and more TMD as age increased. This pattern is true for both heart disease and cancer (**Table 2**).

Etiology

There is not yet a universally known cause of TMD. Most factors are not proven causal factors, but only have been shown to have associations with TMD. The masticatory system can have its dynamic balance changed so that the various components can become dysfunctional. Direct trauma as well as other anatomic, systemic, pathophysiologic, and psychosocial factors can disrupt the masticatory system's equilibrium and are associated with TMD. The dental profession historically has viewed occlusion as a primary etiologic factor for TMD. Occlusal features such as working and non-working posterior contacts and discrepancies between the retruded contact position (RCP) and intercuspid position (ICP) have been commonly identified as causes of TMD. Occlusion has long been seen as a major cause of TMD. Some have seen malocclusion as a cause, and other have seen centric relation-centric occlusion discrepancy as a cause. The literature does not explain the role of occlusion in the etiology of TMD,[65-84] although many studies have tried to assess that role.[71,75,81,85]

Dental study casts (as well as the teeth) can give an indication of dental tooth wear over time. This can be an indicator of bruxism. Mounted casts in the presence of painful joints and/or muscles are not reliable due to joint pain, muscle pain, or joint edema.[86] Even though mounted casts show the amount of tooth wear, they are not good indicators of the etiology of TMD, and should not be used specifically for the diagnosis of TMD.[87]

Skull studies[88-90] and studies of patients with osteoarthritic change[91-96] have correlated loss of molar support with bony changes in the TMJ. Both osteoarthritic changes and tooth loss increase with age; when age is controlled for, these associations disappear.[85,97]

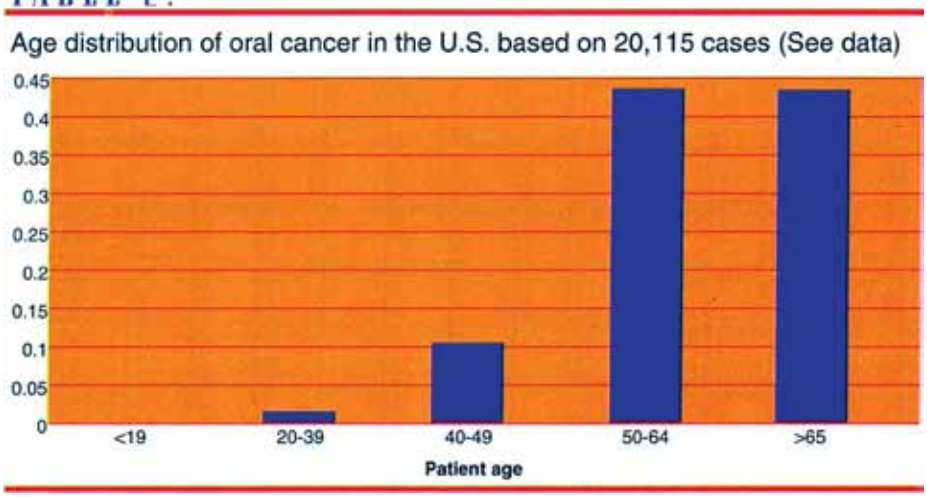
Psychosocial factors also influence TMD by impacting a patient's capacity to function adaptively. There is some evidence that TMD patients experience more anxiety than healthy control groups, and also that patients with pain more than 3 months suffer more depression.[73,99-103] Both anxiety and depression may not only result from and predispose patients to TMD, but also patients may present with mental disorders unrelated to TMD. A careful consideration of psychosocial factors is important for the management of TMD patients.

Diagnosis

Temporomandibular disorders first gained notoriety in the early 1930s, when James Costen, an ear, nose, and throat specialist, noticed that his patients' complaints were not limited to arthritis-like symptoms, but also included dizziness, ringing in the ears, headaches, and plugged ears.[104] Costen's treatment was to provide for joint traction and stability, and it met with predictable success. This approached reinforced and firmly established the use of occlusal-biomechanical approaches as the primary method of treatment for facial pain and dysfunction problems that were collectively described as Costen's Syndrome. The occlusal-biomechanical method predominated until the 1960s.

In the 1960s and 1970s the psychophysiological theory became popular. This theory advocated that, except for obvious degenerative arthritic conditions, temporomandibular disorders were not due to occlusal abnormalities but had a psychological factor as a primary etiology. These symptoms were referred to as myofascial pain dysfunction syndrome. In the late 1970s and 1980s, the intracapsular problems associated with the TM apparatus were more clearly defined by a series of anatomic and radiographic studies. This led to the conclusion that patients did not have a single syndrome, but had many different problems, including internal derangements, osteoarthritis, and myogenesis disorders, chronic pain, and other orofacial sensory disturbances.

TABLE 2.



The American Academy of Orofacial Pain has established a classification system based on the International Headache Society (IHS) classification of head, neck, and neuralgic pain.[105] Clinical diagnostic criteria are included for each diagnostic disorder. Even though examination findings can vary from doctor to doctor, a commonly used method for diagnosing TMD is a thorough history and examination.[106]

Electrodiagnostic devices measure signs, not symptoms. A click and an abnormal opening pattern can be measured whether symptomatic or not. Asymptomatic clicks are common to the general population.[107-109] Imaging, in the form of axially corrected tomographic radiographs, and magnetic resonance imaging (MRI) of the TMJs can both give additional important information in the diagnosis of TMD.

Treatment

All of the above controversies come down to the most important one, how do we treat our patients? Some practitioners state that there is a high prevalence of TMD, and if not treated will progress to more degenerative and debilitating levels of disease. Some practitioners say that occlusion is the etiology of TMD and that the occlusion must be treated. Other clinicians recommend a combination of clinical treatment such as medications, physical therapy, interocclusal appliance therapy, and self-care instruction to the patient. Joint lavage is the most common surgical recommendation.

Science is not absolute, and what we thought was good, scientifically based treatment at a given period in time may be shown to be incorrect at a later period of history. It is in this light that the ethical issue of "do no harm" comes into play. There is the concept of conservative (reversible) versus invasive or irreversible treatments. Studies show that many TMD patients achieve good pain relief with reversible therapy such as behavior modification, physical therapy, medication, and orthopedic appliances.[20,110-112] These conservative therapies also provide good long-term results.[113-115]

If good results can be demonstrated with these conservative therapies, then other therapies such as orthodontics, full-mouth reconstruction, and orthognathic surgery need to be evaluated as to their risk and benefit to the patient.[116] Ethics would seem to dictate that treatment can benefit some patient equally with less risk, then that would be the preferred choice.

Management

Management of TMD has been primarily based on treatments selected by the clinician's specialty or personal bias, rather than on science.[117,118] However, there are few prospective clinical trials providing guidance, yet there is the need for further research for the benefit of our patients.

The scientific literature seems to support that TMD can be a self-limiting disorder that affects patients mostly between 30 and 50 years of age.[48-54] For TMD patients, the model of low back pain management has been proposed.[32] An accurate diagnosis, counseling the patients to reassure them that the disorder is manageable, and good medical support to reduce pain using medications, splints, and physical therapy, as well as a home care program that instructs the patients on what they can do for their problem will allow the doctor and patient to manage the disorder in many cases.

In the United States, it is becoming more common for prosthodontists, oral surgeons, and orthodontists (especially those graduating in the past 10 years from accredited specialty programs) to refer TMD patients to dentists that have special education and experience in TMD, although some patients may eventually need those other services. The dental profession has the responsibility for the diagnosis and treatment of TMD. Keeping abreast of the current scientific literature on TMD will help raise our standards.

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CDA JOURNAL, VOL 26, Nº11

The Evolving Demographic Makeup of Dental Graduates

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ABSTRACT The gender, racial and ethnic makeup of dental school graduates and advanced dental education program students is undergoing changes that to some extent mirrors the developments in the general population. There have been marked decreases in the ratio of white dental school graduates to the white population, but limited changes in the ratio of minority group graduates to their respective national populations. Compared to their representation in dental schools, women and minority group graduates are under-represented in specialty training programs, with wide variations by specialty fields. There have been marked decreases in the proportion of dental school graduates whose immediate plans include self-employment practice and increases in the proportion anticipating some form of employment.

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Most presentations on dental school enrollment emphasize 1) the marked numeric increases during the 1970s, decreases during the 1980s and general leveling off in the 1990s or 2) the evolving numeric gender and racial composition of dental school classes. Limited attention has been directed to: 1) the relationship of the changing demographics in dental schools and the general population, 2) whether these changes are uniform in dental schools throughout the nation, and 3) the evolving demographics of enrollees in advanced dental training programs.

The following presentation will review these developments to provide current practitioners (many of whom have limited contact with dental schools and advanced education programs) with an overview of dramatic demographic changes in the student bodies of dental education programs. The ability of the profession to reach out and provide services to increasingly diverse communities may well be enhanced by a profession that more closely reflects the demographics of the population it serves.*

* Anecdotal commentaries by patients, practitioners and their staffs to this writer often indicate patient preferences for services by practitioners with common language, culture, and race. This ability to " identify" with particular demographic characteristics is not lost on politicians in their selection of candidates for a "balanced slate" that would attract voters of varying backgrounds.

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National demographics

General population

In the mid 1990s, the Bureau of the Census estimates that approximately three-quarters (74 percent) of the resident U.S. population is white (non-Hispanic). The Bureau projects that by the middle of the next century the total population of the country will increase by more than 120 million residents and there will be marked changes in the distribution of the various minority and nonminority population groups. The proportion of the resident population that is white (non-Hispanic) will be reduced to slightly more than half (53 percent) of the U.S. residents. The Hispanic population will increase from 10 to 24 percent, the African-American population will increase from 12 to 14 percent, and the Asian-American population will increase from 3 to 8 percent. The American Indian population will continue at approximately 1 percent.[1]

Dentists

As the general population is undergoing dramatic changes in its composition, so too is the dental profession beginning to reflect to some extent the population environment within which it provides services.[2] Among dentists about to enter the labor force, the percentage of white dental students in senior classes decreased substantially – in 1980 it was 90.1 percent, in 1996 it was 70.1 percent (a 22 percent decline). By contrast, Asian/Pacific Islanders have shown the largest increase in the number of minority senior dental students (from 197 to 693 students) (**Table 1**).

In 1990, 14,100 female dentists represented 9.5 percent of the number of active dentists. By 2020, the federal government projects more than 41,000 active female dentists (30 percent of all dentists). In the late 1980s, African-Americans dentists comprised 2.6 percent of all active dentists, with female African-American dentists expected to increase at a faster rate than their male counterparts.[2]

TABLE 1

Dental School Graduates by Race and Ethnicity: 1980-1996[3-5]

Year	White	African American	Hispanic	American Indian	Asian American	Total
1980	4,736	190	119	14	197	5,256
1985	4,522	233	213	17	378	5,353
1986	4,162	195	208	10	382	4,957
1987	3,869	210	231	11	396	4,717
1988	3,660	227	221	14	459	4,581
1989	3,288	193	296	14	521	4,312
1990	3,165	216	320	8	524	4,233
1991	2,854	204	346	12	577	3,995
1992	2,796	174	296	12	640	3,918
1993	2,699	171	288	12	607	3,778
1994	2,766	194	292	13	603	3,875
1995	2,724	201	300	8	660	3,908
1996	2,674	205	209	9	693	3,810

TABLE 2

Ratio of Dental School Graduates per Million Population by Respective Race and Ethnicity: 1980-1996[1,3-8]

Year	White	African American	Hispanic	American Indian	Asian American	Total
1980	24.3	7.1	8.1	9.8	52.8	22.0
1985	22.3	7.7	11.5	10.7	68.6	22.4
1986	20.4	6.6	10.8	6.1	65.3	20.6
1987	18.8	7.0	11.6	6.6	64.1	19.3
1988	17.6	7.5	10.8	8.2	70.3	18.6
1989	15.8	6.4	13.9	7.1	75.2	17.5
1990	15.2	7.1	14.3	3.8	70.3	17.0
1991	13.6	6.6	15.1	5.7	74.1	15.8
1992	13.1	5.5	12.3	5.6	75.7	15.4
1993	12.6	5.3	11.6	5.5	68.1	14.7
1994	12.8	5.9	11.4	5.9	64.3	14.9
1995	12.5	6.1	11.3	3.6	67.0	14.8
1996	12.2	6.1	7.6	3.9	67.1	14.4

Numbers and Diversity of Graduates

Between 1980 and 1996, the number of dental school graduates decreased by 29 percent (a decrease of more than 1,500 graduates) (**Table 1**). It's important to note the decrease in the number of

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TABLE 3

Minority Group Graduates by Gender and Schools with the Greater Number of Minority Group Graduates: 1996[5]

African-American*			Hispanic**			Asian-American***		
Dental School	Male	Female	Dental School	Male	Female	Dental School	Male	Female
Howard	17	26	Boston	3	6	Boston	19	20
Iowa	2	4	Florida	7	5	Columbia	13	15
Maryland	4	4	Loma Linda	4	4	Loma Linda	21	15
Meharry	12	22	Marquette	5	2	New York U	31	15
Michigan	6	1	New Jersey	4	5	Penn	13	14
Ohio State	2	4	New York Uni	6	4	South Cal	36	36
Temple	4	4	Puerto Rico	18	24	Tufts	22	21
SUNY Buffalo	4	3	Temple	5	2	Univ Cal LA	18	15
			Univ. Tex Bay	3	3	San Francisco	13	23
			Houston	3	4	UOP	31	16
			San Antonio	10	6			
Subtotal	51	68		68	65		217	190
All Schools	90	115		114	95		377	316
	205	209	693					
% in Schools	56.6%	59.1%		59.6%	68.4%		57.5%	50.6%
58.0%	63.6%	58.7%						

* Schools with more than five African-American graduates

** Schools with more than five Hispanic graduates

***Schools with more than twenty-five Asian-American graduates

graduates while the general population has continued to increase. During this period, the number of graduates per million population decreased by 35.7 percent (from 22.4 to 14.4 graduates per million population) (**Table 2**).

As a result of the annual decrease of more than two thousand white graduates between 1980 and 1996, the ratio of white dental school graduates per million white population has decreased by 50 percent. By contrast, the number of Asian-American graduates have more than tripled, resulting in graduate-to-population ratios that have been more than five times the ratios for whites and more than ten times the ratios for African-Americans and Native Americans.

There have been minor changes in the number of African-American graduates, resulting in an increase through 199, and then followed by a decrease through the mid-1990s, in the ratio of African-American graduates to the African-American resident population. The numbers of Native Americans graduating from dental school have been extremely limited (never more than 17 per year), with limited ratios per American Indian population (comparable in most years to African-American ratios).

The number of Hispanic graduates and the ratio of Hispanic graduates to the Hispanic population increased through 1991, followed by a period of limited change in the 1990s and a decrease in 1996 (Tables 1 & 2).

Variations by Dental Schools

In 1996, the overall small number of African-American and Hispanic graduates from dental schools were concentrated in a relatively small number of dental schools. Eight schools had more than five African-American graduates, including two schools (Howard and Meharry) which had more than one third (37.6 percent) of all African-American graduates. Eleven schools had more than five Hispanic graduates, including Puerto Rico, which had 20 percent Hispanic graduates.

Ten dental schools reported more than 25 Asian-American graduates, including four schools in California reporting 27.1 percent of all Asian-American graduates (**Table 3**).

In 1996, women represented 36 percent of all dental school graduates. Six dental schools reported that more than half of their graduates were women, including Meharry, with women representing 65.8 percent of its graduates (**Table 4**).

TABLE 4

Dental Schools with Women Representing More than 50 Percent of Graduates: 1996[5]

Meharry	65.8%
Puerto Rico	57.1%
Connecticut	55.2%
Howard	54.7%
UC San Francisco	53.4%
Maryland	52.2%
National Average	36.4%

Advanced dental education

Specialty training

Women

In 1995, women represented 36 percent of all dental school graduates, but only 27 percent of the total enrollment in specialty programs. Compared to their representation in the dental school graduating class, they were "over-represented" in pediatric dentistry (55.8 percent) and oral and maxillofacial pathology (44.0 percent) programs and "under-represented" in prosthetic (24 percent), endodontic (20 percent), and oral and maxillofacial surgery (9.4 percent) programs.

African-Americans

Student enrollment was slightly less than the representation in the graduating dental school class, with "over-representation" in dental public health (14 percent) and oral and maxillofacial pathology (7.8 percent) and "under-represented" in periodontic (1.7 percent) programs.

TABLE 5

Total Enrollment in Advanced Dental Education Programs by Gender, Race and Ethnicity: 1995[9]

Type of Program	Male	Female	White	African American	Hispanic	American Indian	Asian-American	Total
Specialty								
Dental Public Health	32	22	39	6	4	0	5	54
Endodontics	279	70	282	7	13	1	46	349
Oral & Max Pathology	21	17	21	3	3	0	11	38
Oral & Max Surgery	775	81	704	36	29	1	86	856
Ortho. &Dent Orthoped	413	229	500	23	36	2	81	642
Pediatric Dentistry	169	214	249	20	47	2	65	383
Periodontics	310	137	329	8	38	1	71	447
Prosthodontics	333	106	266	8	59	-	106	439
Combined Specialty	4	3	5	-	-	-	2	7
Subtotal	2,336	879	2,395	111	229	7	473	3,215
Total	72.6%	27.4%	74.5%	3.5%	7.1%	0.2%	14.7%	100%
Non-specialty								
General Practice	606	350	664	79	59	3	151	956
Advanced General Dent	308	154	315	25	44	-	78	462
Subtotal	914	504	979	104	103	3	229	1,418
Percent	64.4%	35.6%	69.0%	7.3%	7.3%	0.2%	14.7%	100%
Total	3,250	1,383	3,374	215	332	10	702	4,633
Percent	70.1%	29.9%	72.8%	4.6%	7.2%	0.2%	15.2%	100%
Percent distribution of Dental School Grads	64.0%	36.0%	69.7%	5.1%	7.7%	0.2%	16.9%	100%

TABLE 6

Immediate Plans Upon Graduation from Dental School: 1978, 1990, 1995(10)

	1978	1990	1995	Change 1978-1995
Solo Practice	21.5%	5.8%	5.8%	-73.0%
Partnership or Group Private Practice	17.9%	12.0%	11.1%	-37.9%
Private Practice Employee	19.1%	31.3%	32.9%	72.2%
Advanced Education	18.9%	33.4%	36.0%	85.7%
Teaching, Research, Admin.	1.1%	1.0%	1.1%	–
Government Service	19.7%	11.6%	8.9%	-54.8%
Undecided	N/A	4.9%	4.2%	–

Hispanics

Student enrollment in specialty as comparable to their proportion in dental school graduating classes. They were "over-represented", however, in prosthetic (13.4 percent) and pediatric dentistry (12.2 percent) and "under-represented" in endodontic (3.7 percent) and oral and maxillofacial surgery (3.3 percent) programs.

Asian-Americans

Student enrollment in specialty programs was slightly less than their representation in dental school graduating classes, but with "over-representation" in oral and maxillofacial pathology (28.9 percent) and prosthetic (24.3 percent) programs, and "under-represented" in oral and maxillofacial surgery (10.0 percent) and dental public health (9.2 percent) programs (**Table 5**).

General Practice

By gender, race and ethnicity, the proportionate representations in the general practice programs were comparable to the representation in the graduating class (**Table 5**).

Senior Dental Student Plans

In addition to the evolving demographic characteristics of dental classes, the immediate plans of dental school seniors have changed since the late 1970s. In 1978, almost two out of five seniors (39.4 percent) planned to enter some form of private practice ownership, compared to less than one in five seniors (16.9 percent) in 1995. Between the late 1970s and the mid 1990s, there was a 72 percent increase in the percent of seniors planning to be an employee in a private practice, an 85 percent increase in those planning advanced education, and a 55 percent decrease in those planning on government service. (**Table 6**). The change in plans may be a reflection of any number of factors, including:

- Increased indebtedness. In terms of constant dollars (i.e. removing the effects of inflation) the average senior debt more than doubled between the late 1970s and the mid 1990s. In 1995, in terms of current dollars, the average graduate debt was $99,456 for graduates of private dental schools, $52,817 for graduates from public schools, and $80,839 for graduates from state-related schools.[10]
- Increased practice start-up costs.
- Availability of positions in the armed services being replaced by increased numbers of general practice residencies.
- Changed delivery modalities, including HMO's, IPA's, POS systems and any number of other third party arrangements.
- Increased interest in combining parenting and professional careers.

Findings

Since 1980, there have been marked decreases in the proportion of white dental student graduates per white population, but limited changes in the ratio of minority group graduates and their respective national populations. The ratio of African-American and American Indian graduates and their respective national populations consistently have remained the lowest of all groups, while Asian-American ratios have remained the highest (at times 10-15 times that of other minority groups).

Minority group dental students are not distributed uniformly in dental schools throughout the nation (more than one-third of African-American graduates were from two schools, 20 percent of Hispanic graduates were from one school, and almost one-third (32.3 percent) of all Asian-Americans graduated from schools in California.

Compared to their proportion in dental school graduating classes, smaller numbers of women and minorities enrolled in specialty training programs.

Commentary

There is no question that all areas of the profession should be open to any and all qualified applicants but, as it has been argued previously,11 it is fallacious reasoning to assume that the demographic distribution of dental personnel must match the population distribution to assure needed care for all segments of our communities, or that particular groups must be recruited to the profession so that "they" will "return" to care for "their people".

On the other hand, we should not overlook the potential willingness of populations to seek care from providers with whom they can more readily identify. If this argument holds some value, then the continued limited numbers of

African-Americans, Hispanics and Native Americans entering dentistry (or particular areas within the profession) would tend to indicate that we have a long way to go.

If we are to understand and plan for the future of the profession, then it would be essential to explore interests and expectations of the different populations being attracted to the profession. Note: reports by the American Association of Dental Schools do not distinguish practice plans by gender, race or ethnicity.

The practice of dentistry and the profession itself will be different in the future. It would be "nice" to know more about the potential for these differences than just the fact that the number of dental school graduates had "leveled down" while the general population continues to increase.

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CDA JOURNAL, VOL 26, Nº11

Effect of Doxycycline on the Apical Seal of the Retrograde Filling Materials

Rahmat A. Barkhordar, DMD and Thomas Russel, DMD

ABSTRACT In this study, we examined the effect of doxycycline hydrochloride (DH) on apical seal. Results indicated that teeth that were retrofilled with IRM or amalgam following doxycycline irrigation had significantly less dye penetration ($p<0.05$). Due to its antimicrobial activity, smear layer removal ability, and improvement of apical seal, doxycycline solution may be used as an irrigant.

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Tetracyclines have several properties of interest to endodontists and other dentists. They are antimicrobial agents, effective against periodontal pathogens, and concentrate in gingival fluid at levels four times higher than in blood.[1] These antibiotics bind strongly to root surfaces and when released are still biologically active.[2] Release of tetracyclines from root surfaces provides a sustained level of antimicrobial agent at the site of periodontal ligament diseases.[3]

This class of antibiotics has also been shown to inhibit mammalian collagenases. Inflammatory diseases such as periodontitis include a pathological excess of tissue collagenases which may be blocked by tetracyclines, leading to enhanced formation of collagen and bone formation.[4] Doxycycline, a hydroxy derivative of tetracycline, is the most potent anticollagenase antibiotic among commercially available tetracyclines,[5] and is also relatively more potent against most periodontal pathogens.[6,7]

Root surfaces in periodontal pockets undergo subsurface bacterial contamination of cementum and dentin.[8] As a result, root surfaces accumulate endotoxin[9] and exhibit collagen loss, which may suppress fibroblast migration and proliferation on contaminated cementum,[10] affecting periodontal regeneration. Root surface conditioning with acidic agents such as tetracyclines removes smear layer and surface contaminants, such as endotoxin,[11] At the same time, surface demineralization widens the orifices of dentin tubules[12]

and exposes the cementum collagen matrix, stimulating fibroblast attachment and growth.[13] Monocyte production of resorptive cytokines in response to diseased cementum has been shown to be potently inhibited by tetracyclines.[14]

Instrumentation of dentin leads to accumulation of a smear layer[15] covering the dentinal surface and occluding the dentinal tubules, thereby reducing the permeability of dentin.[16] Smear layer contains organic materials including dentinal debris, odontoblastic processes, and blood cells, and consequently, bacteria may penetrate and colonize it.[17] Smear layer also presents a variable interface between a dental material and dentin and prevents filling materials from directly contacting dentin and penetrating dentinal tubules.[18] Because smear layer prevents adaptation of a filling material to the dentinal wall, the seal provided by the material is affected.

Removal of smear layer seems desirable in the situation of apical retrofills, where a filling material is placed in a bacterially contaminated root apex in order to obtain an adequate seal to the root canal, and thereby promote healing. Tetracyclines have been shown to remove smear layer from root surfaces and from within root canals.[19]

Doxycycline may be a useful agent in surgical root canal treatment. The present study was designed to assess in vitro the effect of irrigation with doxycycline HCl on the apical seal of retrograde fillings.

Materials and Methods

Sixty human extracted incisors were selected, autoclaved and stored in distilled water. The crowns were removed prior to any evaluation. The root canals were cleaned and shaped to the apex with K files (Kerr, USA) up to #60, rinsed with hypochlorite and obturated with warm gutta-percha and Kerr Root Canal Sealer (Kerr, USA). The apical 2 mm were resected, and a retrofill preparation was made to the depth of a #331 bur (S.S. White, USA). The roots were divided into 6 groups of 10 roots. The apical cavities in Groups 1- 3 were irrigated with saline as a control. The cavities in Groups 4-6 were irrigated with doxycycline HCl, 100 mg/ml. For both irrigants, 10 retrograde cavities were filled with warm gutta-percha using a Touch-N-Heat (Analytic Technology, USA), 10 with Tytin amalgam (Kerr, USA), and 10 with IRM (Caulk, USA).

The treated roots were then stored in a humidor for seven days. The roots were air-dried and painted with two coats of nail polish, except for the apical area. The roots were immersed in 1 percent methylene blue dye for 24 hours. The roots were then sectioned longitudinally, filling materials were removed, and degree of dye penetration measured in a dissecting microscope equipped with a micromeasure grid (magnification x10). The dye penetration was measured from the cavosurface into the root canal system, in millimeters. The mean results were statistically evaluated by a Student-Newman-Keuls test and ANOVA.

TABLE 1

Methylene blue penetration for three retrofilling materials preceded by irrigation with either saline (control) or doxycycline-HCl.

Group Irrigant	Retrofilling	Mean	Dye Penetration (mm)	S.D.
1	Saline	Gutta-percha	3.29	+ .26
2	Saline	Amalgam	2.21	+1.60
3	Saline	IRM	2.65	+1.03
4	Doxycycline-HCl	Gutta-percha	2.49	+1.25
5	Doxycycline-HCl	Amalgam	1.88	+1.10
6	Doxycycline-HCl	IRM	1.55	+1.05

Results

Amalgam and IRM retrofills allowed significantly less leakage than gutta-percha for both control and experimental groups. Each retrofill material allowed significantly less dye leakage when preceded by doxycycline irrigation. The results show that the best seal in this study was obtained by IRM and amalgam following doxycycline HCl irrigation ($p<0.05$) (Fig. 1-2). The results for these two materials were not significantly different.

Discussion

Improved apical seal of retro-fillings has been pursued vigorously in an effort to improve the clinical results of apical surgery.[20]

The results of this study show significantly superior apical seal with IRM and amalgam when preceded by irrigation of the retro-prep with doxycycline HCl. This may be due to the previously demonstrated ability of tetracyclines to remove smear layer from dentinal surfaces in a time dependent manner.[21] The removal of the loosely attached smear layer from the cavity surfaces with subsequent opening of dentinal tubules and demineralization of dentin, creates a retentive surface for interlocking of restoratives,[22] which may be responsible for the improved apical seal seen in this study.[23] The results of this study agree with those of Jodaikin and Austin who found that removal of smear layer with EDTA reduced dye leakage around amalgam restorations.[24]

Smear layer removal from resected root ends and dentin demineralization by another acidic agent, citric acid, has been shown to be associated with more rapid and complete cementum deposition on

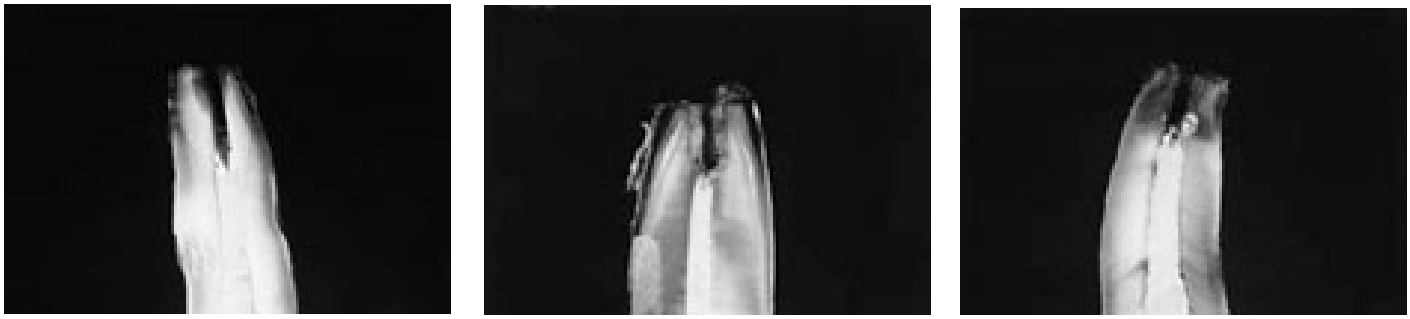

Figure 1. Example of apical dye penetration of specimen irrigated with a saline and retrofilled with:
1 A – Gutta-percha **1 B** – Amalgam **1 C** – IRM**2 C** – IRM

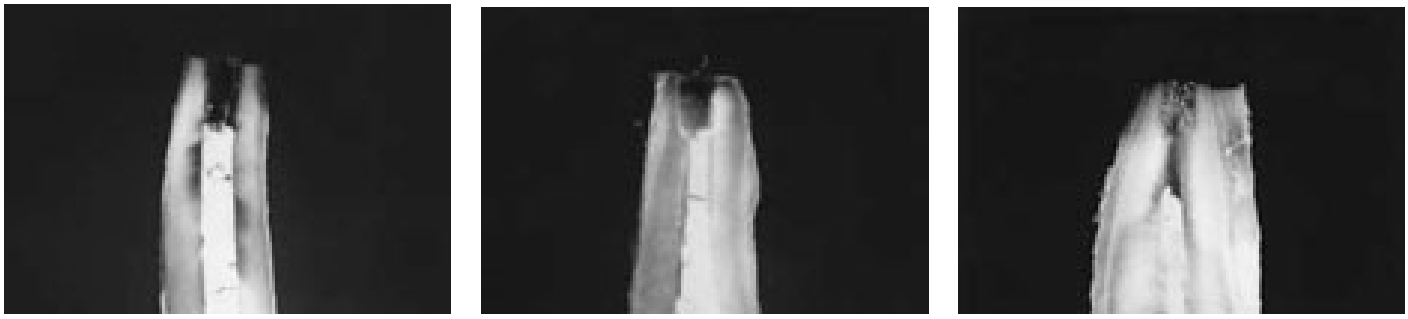

Figure 2. Example of apical dye penetration of specimen irrigated with doxycycline-HCl and retrofilled with:
2A – Gutta-percha **2 B** – Amalgam 2 **C** – IRM**2 C** – IRM

the root end. This in turn promotes more rapid dentoalveolar healing.[25] Tetracycline and citric acid have been shown to produce comparable morphological changes on root surfaces[26] and therefore would be expected to have similar efficacy in promoting healing after apical surgery. Unlike citric acid, however, doxycycline is also a potent antibiotic. The long lasting substantivity of doxycycline HCl on root surfaces supports the concept of using resected root surfaces as a substrate for the deposition and slow release for local doxycycline delivery.[27]

The present study has demonstrated that irrigation with doxycycline significantly improved the apical seal of two retrofill materials. It shows promise as an adjunct to endodontic therapy, but further studies are needed to evaluate the in vivo efficacy of doxycycline in endodontic systems.

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CDA JOURNAL, VOL 26, Nº11

The Effect of BioBurden on In-Depth Disinfection of Denture Base Acrylic Resin

Timothy R. Saunders, DDS; Villa L. Guillory, DDS; Stephen T. Gregoire, MS; Meade Pimsler, PhD; and Mary S. Mitchell, MHS

ABSTRACT This study evaluated the effectiveness of three different disinfectant solutions against denture bioburden absorbed within the depth of acrylic resin. Specimens were taken from dentures that had been worn by the patients for 15 to 20 years and were scheduled for replacement.

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Previous studies have demonstrated that dental prostheses brought into the dental office for repair or adjustment are contaminated with bacteria, viruses, and fungi.[1-3] Several authors have discussed effective means of surface disinfection of dental prostheses, however, the vast majority or research on acrylic resin disinfection has been specific to surface contamination and not subsurface disinfection.[4-16] Chau, et. al., contaminated and then disinfected acrylic resin specimens in various disinfectant solutions.[17] These specimens were then fractured and cultured to determine whether the disinfectant solutions penetrated the depth of the acrylic resin. They observed that a 10-minute immersion in 5.25 percent sodium hypochlorite disinfects dental acrylic resin more effectively than either Biocide (Iodophor) or Alcide LD (Chlorine dioxide) disinfectant solutions when used in accordance with manufacturer's recommendations. Prior to this, no studies have been performed sampling existing patient prostheses that have been worn for extended periods of time nor evaluating the effectiveness of subsurface disinfection.

The purpose of this study was to evaluate in-depth disinfection of complete denture prostheses that had been worn for periods of 15 to 20 years.

TABLE 1

The effect of disinfectants on bacterial growth in dental prostheses.

Prostheses	Saline	Alcide	Biocide	10% Sodium Hypo- chlorite&	20% sodium Hypo- chlorite	30% sodium Hypo- Chlorite	40% sodium Hypo- Chlorite	50% sodium Hypo- Chlorite
A1	1.7@	2	7	NG	NG	NG	NG	NG
A2	9	NG#	9	NG	NG	NG	NG	NG
B1	1,2,5	5	1,5	5	10	10	NG	10
B2	2,3	1,2	1,2,3	1	10	11	10	2
C1	2,3	2,3	2,3	1,2,3	6,11	11	2	11
C2	2,3	2,6	2	2,4	11	11	11	11
D1	2,3	5	5,8	5	NG	6	NG	NG
D2	2,3	5	NG	NG	NG	NG	NG	11

Materials and Methods

Complete Dentures

Four maxillary/mandibular complete dentures that had been worn by patients for 15 to 20 years and were scheduled for replacement were used as the source of samples. Eight denture acrylic resin specimens, 8 mm x 8 mm, were taken from each maxillary and mandibular denture flange areas (distal buccal flange of the maxillary denture and the distal lingual flange of the mandibular denture using sterile discs).

Pre-disinfection Culture and ID

The 64 denture acrylic resin specimens were briefly rinsed in sterile saline and dropped into individual test tubes of sterile Mueller-Hinton broth. The specimens were separated into labeled tubes identifying their site of origin. These tubes were incubated at 37C with 5 percent CO_2 for 18 to 24 hours. An uninoculated Mueller-Hinton broth tube of the same lot number was also incubated. Any Mueller-Hinton broth tubes showing no growth at 24 hours were reincubated for an additional 24 hours.

Disinfection Procedure

The specimens were removed from the culture medium, rinsed briefly in sterile saline, then immersed in one of the three different freshly mixed disinfectant solutions using the following disinfection protocols:

1. Biocide (Biotrol International, Louiseville, Colorado): Immerse for 10 minutes in a 0.48 percent solution of Biocide in warm (>20 C) deionized water (2 ml of Biocide in 14 oz of sterile water).

2. Alcide LD (Alcide Corp., Norwalk, Connecticut): Immerse for three minutes in solution that consists of 10 parts per deionized water, one part LD base LD activator.

3. Sodium Hypochlorite (James Austin Co., Mars, Pennsylvania): Immerse for 10 minutes using 5.25 percent (undiluted) sodium hypochlorite and deionized water in the following concentrations: 10 percent solution, 20 percent solution, 30 percent solution, 40 percent solution, 50 percent solution, and 100 percent solution (or undiluted).

4. Sterile 0.9 N saline: Immerse for 10 minutes.

The specimens from all four dentures were disinfected in the three different solutions and 0.9 N sterile saline. The contaminated specimens were placed in sterile specimen cups when immersed in the disinfectants. The specimens were removed from the solution at specified intervals and harvested for bacterial growth.

Microbiological Testing

Isolation Procedure

Following disinfection, the specimens were rinsed briefly with a sterile 0.9 N saline solution and then placed between two sterile metal blocks, wrapped in several layers of sterile gauze and pulverized with a manual impact device. The impact device was also wrapped in new sterile gauze for each plug pulverizing action. The pulverized specimens were dropped into test tubes of sterile Muller-Hinton broth and cultured at 37C for 48 hours. If growth was detected, gram stains were performed and the organisms were subcultured to blood agar, eosin methylene blue agar, and chocolate agar plates.

Identification Procedure

Gram positive organisms were presumptively identified by catalase and coagulase reactions. For catalase testing, suspect colonies from blood agar plates were transferred, using a sterile loop, to a clean, sterile glass slide and tested with one to two drops of 3 percent hydrogen peroxide. Coagulase activity was detected using the Remel Staph Latex Kit. Additional testing included: sensitivity to bacitracin and optochin, reactivity in the CAMP test, the ability to hydrolyze esculin in the presence of

TABLE 2

The Disinfecting Capability of Undiluted Sodium Hypochlorite

Prostheses Sub-Specimens#	100% Sodium Hypochlorites$	Salines$
B1b	NG*	GROWTH
B1c	NG	GROWTH
B2a	GROWTH@	GROWTH
B2c	NG	GROWTH
B2d	GROWTH@	GROWTH
C1b	NG	GROWTH
C1d	NG	GROWTH
C2d	Ng	GROWTH

Randomly selected prostheses plugs exhibiting growth in deffering dilutionso f sodium hypochlorite

*Indicate no growth

@ Organisms identified as "normal oral flora" & Undiluted sodium hypochlorite stock solution (5.25%)

$ 0.0N Saline

bile, and the organisms' ability to grow in Infusion Medium (Remel) containing 6.5 percent NaCl. Confirmatory testing was performed using the Vitek Identification System, GPS-SA and GPI cards.

Gram negative organisms were presumptively identified by their ability to ferment lactose on eosin methylene blue agar, reactivity with indole, and oxidase activity. Confirmatory testing was performed using the AFI 20E system.

Results

All specimens were shown to be colonized by bacteria following incubation in sterile Muller-Hinton broth medium prior to disinfection. Samples were disinfected in two commercial disinfectant solutions (Alcide and Biocide), or in dilutions of 5.25 percent sodium hypochlorite. Growth was observed on all saline disinfection controls. The most common organisms recovered were S. aureus, P. aeruginosa, and E. coli. Gram positive cocci were also recovered from some of the saline control specimens.

Neither Alcide nor Biocide, used in accordance with the manufacturer instructions, was effective in disinfecting the denture acrylic resin. Growth was obtained from seven of eight denture samples disinfected in either solution (effective kill rate 12.5 percent). Dilutions of sodium hypochlorite, ranging from 10 percent to 50 percent of a 5.25 percent solution in distilled water, proved to be three to five times more effective than either Alcide or Biocide.10, 20, 30, 40, and 50 percent dilutions of 5.25 percent sodium hypochlorite in saline effectively disinfected between three and five of eight denture samples (effective kill rates of 37.5 – 62.5 percent, **Table 1**).

n a final set of experiments, denture base material was disinfected in undiluted (100 percent) 5.25 percent sodium hypochlorite (**Table 2**). No growth was obtained from six to eight samples in this series. There was a 75 percent effective kill rate, which was six times more effective than Biocide or Alcide. Normal oral flora were isolated from two of the samples which yielded growth. Control samples cut from the same dentures and incubated in saline instead of sodium hypochlorite all produced growth.

Discussion

In our previous study we observed that 10 minutes immersion in 5.25 percent sodium hypochlorite more effectively disinfected both the interiors and exteriors of purposely contaminated acrylic resin specimens than did either Alcide or Biocide.[17] Specimens were prepared from three different acrylic resins (Lucitone 199, Ortho, and Repair), and were incubated in broth cultures containing a mixture of bacteria. Biocide failed to disinfect two of five Lucitone 199 specimens and four of five Repair specimens. In the same study, Alcide did not disinfect two of five Lucitone 199 specimens, and one of five Repair specimens. In contrast, all specimens were disinfected by immersion in undiluted 5.25 percent sodium hypochlorite.

Similar results were obtained in this study, which employed resin-based material derived from dentures worn by patients for 15-20 years. One striking observation was the effect of microbial bioburden on disinfection. In addition to bacteria, resin-based denture material is coated and infiltrated with protein, polysaccharides, and other materials from the oral environment. This material creates a protective microenvironment for microbes living on and in denture material which must be overcome for effective disinfection in the laboratory. Our results show that bioburden reduces the effectiveness of disinfection by all test disinfectants in this study. Alcide and Biocide were both relatively ineffective, killing all cultivable bacteria and fungi in one of eight denture specimens tested. The effectiveness of disinfection of sodium hypochlorite proved to be three to five times more effective than Alcide or Biocide, however, the protective nature of bioburden was evident (i.e., a ten minute immersion in undiluted 5.25

percent sodium hypochlorite produced an effective kill rate of only 75 percent).

Furthermore, organisms from specimens exposed to disinfection were recovered that were not recovered from the saline control specimens. This may be reflective of heterogeneous colonization of denture material by oral flora which may result from: (1) establishment of microenvironments within the denture material, (2) competition between organisms, or (3) changing oral microflora and oral environment over the years. We believe this does not obscure the results of the study, rather it demonstrates the complexity of the oral microenvironment and the necessity for effective disinfection of a broad range of microorganisms.

Summary

The studies described in this report clearly indicated that 5.25 percent sodium hypochlorite is more effective in disinfecting complete dentures submitted by patients for repair or replacement than either of two commercially available disinfection solutions. Sodium hypochlorite is relatively inexpensive and easily available. Further, material studies have shown common bleach has no discernible structural or cosmetic effect on resin-based denture material. These results indicate sodium hypochlorite is the best available disinfectant for use in dental offices and laboratories.

The data obtained in this study support the hypothesis that acrylic resin complete dentures worn by patients for 15 to 20 years may be contaminated with bacteria both superficially and within the body of the protheses. The data also suggests that a ten-minute immersion in 5.25 percent sodium hypochlorite more effectively disinfects acrylic resin than do either Alcide or Biocide disinfectant solutions used in accordance with the manufacturer's recommendation.

Conclusion

Disinfection of the dental prostheses is the minimum standard of care protocol prior to sending them to the laboratory. This study shows a dental prosthesis must be disinfected on the exterior as well as the interior surface because of contaminating microorganisms. Data from this study suggests that a ten-minute immersion in full strength sodium hypochlorite (5.25 percent) more effectively disinfects dental acrylic resin than either Biocide or Alcide disinfectant solutions.

Future studies are recommended which would evaluate the reaction of varing concentrations and time of disinfection in sodium hypochlorite and partial denture prostheses (eg. Chromium-cobalt).

The views expressed herein are those of the authors and do not necessarily reflect the views of the United States Air Force or the Department of Defense. This paper was originally presented before the American Academy of Maxillofacial Prosthetics, Kansas City, MO, October, 1996.

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CDA JOURNAL, VOL 26, Nº11

What To Give a Dentist

Robert E. Horseman, DDS

Approaching at speeds in excess of Mach 2 is the holiday season again. Although the nation's retailers have long been lobbying to eliminate Labor Day, Halloween and Thanksgiving as annoying speed bumps to the serious financial adjustment period of Christmas/Hanukkah, they've only managed so far to downgrade Columbus Day. Bank and federal employees, along with elements of the Italian Anti-defamation League, have successfully blocked the complete elimination of this vital holiday – and more power to them; we need more bank holidays to supplement "Please Don't Mug Our ATM Customers Day" and the week-long celebration of ".02% Interest On Passbook Savings Extravaganza."

The so-called "gentleman's agreement" to not display Christmas decorations until the last fireworks have sputtered out on July 4th is still in effect, at least for the time being, pending legislation to rescind it.

The point is, the burning question of what to give a dentist is something that must be addressed by families right now before the winter solstice is upon us. It is safe to assume that every dentist who wants one or more of the standard reception rooms signs – "Payment is expected at time services are rendered unless other financial arrangements have been made," "We cater to cowards," "You don't have to floss all your teeth, only those you want to keep," and "No tank tops or flip-flops" – already has them. Fortunately for gift-givers, recent federal, state, county and local regulations have made the problem of what to give much easier. Sterilization of handpieces has made the presentation of a new handpiece the primo gift of the season.

Manufacturers of handpieces, recognizing their enviable position at the top of the list, and knowing their product can only last a few sterilization cycles before it is rendered hors de combat, have been quick to emulate those entrepreneurs of the fruit industry, Harry and David. For only a few thousand dollars, The Handpiece-of-the-Month Club will see that a brand-new, fresh handpiece is delivered right to your operatory each month with a complementary can of lubricant. Optional, but a thoughtful touch, is a spare turbine and a nice selection of O-rings.

Devotees of catalog buying should definitely check out both The Sharper Image and Danmark's offerings this year. Since the deregulation of the phone company and the introduction of amusing pleas for your long distance business, telephones have become much more sophisticated, to match, one supposes, the innovations in the billing services. A phone that should appeal to dentists comes with miniature circuits designed in Bulgaria, manufactured in China and assembled in Mexico. These contain chips that are capable of detecting whines, aggression and varying degrees

of obtuseness. Once detected, the caller is obliged to go through a complicated series of the familiar "press 1," press 2," press 3, 4 and 5" gambits until he or she gives up in disgust. You can image what this would do for the morale of the whole office.

Stocking stuffers for dentists are always a problem. Tangerines, nuts and knick-knacks commonly found in Cracker Jacks just don't cut it this season. Likewise, a microfiche of everything that's published on Direct Reimbursement is passé. Slim little packets of impossible-to-open toothpaste samples containing 2 mg of paste and miniature decanters of plaque-dissolving liquids in red and green holidays hues, are also well down on a dentist's wish list.

What would be sure to please is a supply of special water in 50-gallon drums in designer colors that could be stored along the hall walls or in your bathroom if you have one. This water is certified by the manufacturer (H2O "R" Us) to be bacteria-free, mineral-free and guaranteed to flow in only one direction, i.e., forward. For those dentists still concerned about the purity of their water, H2O "R" Us offers a kit containing enough hydrogen and oxygen in their natural state to make 75 liters of liquid. Having never been water before, this compound is warranted to be free of contaminants other than what the dentist inadvertently introduces himself, in which case the company is not liable. It should be noted, the company says, that homemade water is omnidirectional and that any backflow problems encountered during its use are, again, not the company's responsibility.

Instructions on how to incorporate this gift into the dentist's existing system will be forthcoming, suppliers assure us. In the meantime, it would give him something to do other than worry about actual dental treatment on actual people.

When asked by perplexed relatives what I would really like for the obligatory holiday gift, my standard response has always been, "Just give me the money." Up until now, this has always been met with either derision or downright hostility and I have come to realize that I wasn't specific enough. This year I am pleased to point out the existence and availability of the note with a favorite of mine, Ben Franklin, displayed right on the front and just to the left of center. I would love to have several of these and would cherish them as long as it took to pay off the reminders in January that my account is overdue.

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