


# JOURNAL *of the*

MASSACHUSETTS DENTAL SOCIETY

Fall 2007



**The Safety of  
Human Bone  
Allograft in  
Dental and  
Implant  
Surgery**

## GIVE A LITTLE BIT AND MAKE A BIG DIFFERENCE

ONCE AGAIN, MASSACHUSETTS DENTAL SOCIETY MEMBERS HAVE DISTINGUISHED themselves and their profession as the health care providers who truly care. The successful efforts of countless MDS members and staff have culminated in the purchase, equipping, and delivery of the MDS Foundation's Mobile Access to Care (MAC) Van.

Since the MAC Van hit the road with volunteer dentists and auxiliary staff earlier this year, more than 800 underserved children have received free dental screenings and basic preventive dental treatment, including sealants, comprehensive exams, fluoride treatments, bitewing X-rays, and fillings. More than \$200,000 worth of services have occurred on the MAC Van thus far. Because of the MAC Van, many of these children had their first dental care encounter and, frighteningly enough, were given their first toothbrush.

Think about that. There are children in Massachusetts who, before they set foot on the MAC Van, didn't have their own toothbrush.

In addition to these efforts to bring dental care to the children of the Commonwealth, the MDS Foundation has provided support to dental auxiliary students and programs to enhance educational opportunities for those wishing to pursue a career as a dental hygienist, dental assistant, or dental laboratory technician.

In the past, we have urged our members to keep sight of the fact that our greatest strengths and accomplishments come from within—both as a Society and as individuals. The leadership, staff, and volunteers of the MDS Foundation have given us the opportunity to become stronger and better professionals by helping us to “do good.” Please help the Society continue in these efforts by contributing financially and volunteering in any way you can. Volunteer an afternoon on the MAC Van to give children in your district the care they so desperately need. Donate financially to the MDS Foundation to help provide scholarships for the allied programs. Visit [www.mdsfoundation.org](http://www.mdsfoundation.org) for more opportunities to help.

Not only will you be helping those who are in need, you will make it possible for all of us to continue to uphold the highest ethical standards of the dental profession. In so doing, you have the ability to bring happiness to many people: many of whom you don't know, some of whom you'll never see.

Your donations, in whatever forms they take, will bring you feelings of accomplishment and gratification. Enjoy these gifts. ■

*David B. Becker*

*Arthur I. Schwartz*



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# LIFE INSURANCE SOLUTIONS FOR UNMARRIED COUPLES

**U**NMARRIED COUPLES FACE SOME UNIQUE FINANCIAL AND estate issues that life insurance can help solve. For instance, married couples typically use life insurance to provide funds to help replace income at the death of a spouse. As an unmarried couple, you may have an even greater need for replacement income since the surviving partner is ineligible for spousal benefits from Social Security and many defined benefit pension plans. In addition, both of your estates may have an even greater need for cash to help pay estate taxes, since you are not entitled to the unlimited marital deduction for property you bequeath each other.

With proper planning, life insurance can provide cash to help meet these needs. And since life insurance proceeds do not go through probate, it also offers a way to provide for each other beyond a will, which could be contested by family members.

### Income Replacement

There are two ways to structure life insurance to help provide replacement income. You can either cross-own policies, or you can own individual policies with the other partner named as beneficiary.

With cross-owned policies, you each own a policy on your partner's life. When one partner dies, the surviving partner uses the death benefit proceeds to help provide income. Since the policy is owned by the surviving partner, not the deceased, it is not included in the deceased's estate and thus is not subject to federal estate taxes.

You may need to demonstrate an insurable interest to cross-own policies. Spouses are automatically assumed to have an insurable interest on one another. As an unmarried couple, be prepared to prove insurable interest with evidence of jointly owned assets and, possibly, copies of wills or trust documents.

In the case of individual policies with the partner as bene-

fiary, you each own a policy on your own life, naming your partner as beneficiary. However, since you each own your own policy, the proceeds are included in the deceased partner's estate and may be subject to estate taxes.



### Cash to Pay Estate Taxes

Married couples enjoy a special tax break—the unlimited marital deduction—that allows them to transfer unlimited assets to each other during their lifetime, or at death, free of gift and estate taxes. Since unmarried couples do not fall under the purview of this deduction, the value of any property you leave each other above a certain dollar amount—

\$2 million for 2007—may be subject to federal estate taxes. Some states also levy estate taxes. Life insurance provides cash that can be used to help pay estate taxes. You can either cross-own policies or create an irrevocable trust.

With cross-owned policies, you purchase insurance in the amount of the estimated taxes. As mentioned above, the advantage of this approach is that, since you—and not your partner—now own the policy, the proceeds are not included in the partner's estate.

You can gain even greater protection against the possibility of estate taxes with an irrevocable trust. A trustee buys and owns the life insurance policy; you furnish the trust with the funds to pay the premiums. However, irrevocable trusts must be carefully established to avoid adverse tax consequences. They are costly to set up and, as the name implies, they cannot be revoked.

Life insurance has long provided a valuable solution to married couples who may need cash to help replace income and pay estate taxes at the death of a spouse. As an unmarried couple, lacking some of the special benefits of marriage, your need for cash at the death of a partner may be even greater. As with all insurance and estate planning concerns, it is always best to consult a qualified professional to discuss your particular needs and ensure arrangements are properly structured. ■



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## COMPLACENCY ABOUT DENTAL SERVICES FOR MASSACHUSETTS RESIDENTS WITH DISABILITIES

**I**N THE SUMMER 2005 ISSUE OF THE JOURNAL OF THE MASSACHUSETTS DENTAL SOCIETY, we asked, “Is Massachusetts spending a fair share of health care expenditures for dental services?”<sup>1</sup> The answer was that at the end of the last decade, Massachusetts ranked first among states in per capita personal and government spending for health services. In terms of actual dollars spent, the state ranked 10th in per capita expenditures for dental care, “but Massachusetts rank[ed] 28th in proportion of health care spending for dental care.”<sup>1</sup>

In the Fall 2004 issue of the JOURNAL, we reported that the state residents ranked third nationally in health and social standings,<sup>2</sup> but we noted in the Winter 2004 issue that there was room for improvement in the services for children of the state.<sup>3</sup> Earlier, in 2003, we reported that results from a national study found that “compared to national averages, Massachusetts residents are doing very well in terms of their use of dental services.”<sup>4</sup> But we also found that there were “numerous difficulties associated with the delivery of dental services to the (58,228) youngsters with special needs (i.e., children with one or more disabilities).”<sup>5</sup>

Nevertheless, by 2005 Massachusetts continued to do quite well compared to other states in terms of health and related issues. For example, some of the state’s best results were:

ISSUE RANKING*	
Prevalence of smoking	6
Prevalence of obesity	2
Motor vehicle deaths	2
Occupational fatalities	1
Adequacy of prenatal care	6
Immunization coverage for young children	1
Infant mortality	2
Cardiovascular deaths	7
Child poverty	5

\*1 being best, 50 being worst

The rankings in other areas were not as favorable. For example, Massachusetts had the following rankings: infectious disease (37), violent crime (33), cancer deaths (33), and per capita public health spending (26). Overall, the state ranked ninth.<sup>6</sup>

### Dental Care for Individuals with Disabilities

The New England INDEX (Information on Disabilities Exchange) includes a listing on its Web site ([www.disabilityinfo.org](http://www.disabilityinfo.org)) of dental providers who have expressed a willingness to treat indi-

viduals with disabilities in Massachusetts. The program is located at the Shriver Center of the University of Massachusetts Medical School. There are 226 dentists—3.2 percent of the 6,977 dentists currently registered in Massachusetts—listed in the INDEX. The number of listed providers has remained stable for years. Of the 226 listed providers, 65 are pediatric dentists. Twenty-four of these 65 pediatric dentists accept Medicaid patients (the most common insurance program for youngsters with disabilities), while 74 of the 226 listed providers accept MassHealth patients.<sup>7</sup>

### Complacency

No doubt there are many dentists who provide services to individuals with disabilities who are not listed in the INDEX. Similarly, there are many practitioners (other than pediatric dentists who are listed in the INDEX) who accept Medicaid patients. It’s nice to know that the state’s overall ranking in a variety of health and social indicators is ninth. But what of the dental needs of the 58,228 children with disabilities? The latest national survey of children with special health care needs reported that “the service most commonly reported as needed but not received was dental care.”<sup>8</sup>

How complacent should the dental profession in Massachusetts be about the need for dental services for individuals with disabilities when (1) the state ranks 28th in proportion of health care spending for dental care, and (2) only 226 of 6,977 dentists registered in the state are listed in the New England INDEX of practitioners as willing to provide care for individuals with disabilities? ■

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## UNDERSTANDING HIRD REQUIREMENTS

**T**HE HEALTH CARE REFORM REVOLUTION IS IN FULL SWING. You can't pick up a newspaper, listen to the radio, or watch TV without hearing reports about or advertising for this law. Nearly a year and a half after the enactment of the law, it suffices to say that health care in Massachusetts will never be the same. Now that many of the components of the law are being implemented, the deadline for the reporting requirements, which monitor compliance for both employees and employers, is fast approaching.

To help reduce the free-care pool in the state and to meet the goal of insuring more than 95 percent of Massachusetts residents, the reporting requirements will be a crucial component for accounting for all the residents in the state. More than ever, documentation is required for all employers. Accounting for all employees—from those who work one hour to those who work 100 hours a week—is just the first step. Two of the most important forms are detailed below.

**Employer Health Insurance Responsibility Disclosure (HIRD) Form.** This is the vehicle for Massachusetts businesses with 11 or more employees to file with the Massachusetts Executive Office of Labor and Workforce Development (EOLWD). The employer HIRD form must be completed and filed annually by November 15. The information contained in the form includes the following:

- Employer legal name
- Employer DBA name
- Federal employer tax identification number
- Division of Unemployment Assistance account number
- Number of full-time employees
- Number of part-time employees
- Whether or not the employer offers subsidized insurance to full-time employees
- Whether or not the employer offers subsidized insurance to part-time employees
- Whether or not the employer offers a Section 125 cafeteria plan

The HIRD requirements took effect January 1, 2007. By November 15 of each year, employers must report on information for the period ending September 30. Full-time, part-time, seasonal, and temporary staffers are included in the employee tally; independent contractors are not part of the equation. An employer that knowingly falsifies or fails to file any information required in the HIRD form is subject to a fine up to \$5,000.

**Employee Health Insurance Responsibility Disclosure (HIRD) Form.** This is required for Massachusetts residents who work for a Massachusetts employer with 11 or more employees and who

either decline employer-sponsored insurance or the employer's offer to arrange for insurance through the Connector with pre-tax dollars. These employees must fill out and sign an employee HIRD form each year. The employer must retain the signed HIRD form for a period of three years. If the employee does not comply with the employer's request to return the signed form, the employer is required to document its efforts to obtain the form and maintain the documentation for a period of three years.

The employee HIRD form must contain the following:

- Employee's name
- Employer's name
- Whether the employee has alternative insurance coverage
- An acknowledgement that the employee is aware of the individual mandate and the penalties for failure to comply with the individual mandate

As a part of the form, the employee must also acknowledge that:


- He or she has declined to enroll in employer-sponsored insurance and/or has declined to use the employer's Section 125 cafeteria plan to pay for health insurance
- If he or she declines an employer's offer of subsidized health insurance, he or she may be liable for his or her health care costs
- He or she is aware of the individual mandate and the penalties for failure to comply with the individual mandate
- He or she is required to maintain a copy of the signed employee HIRD form, which contains information that must be reported in the employee's state tax return
- By his or her signature, he or she acknowledges the truthfulness of his or her answers.

Employers must obtain signed employee HIRD forms upon the earliest of:

- 30 days after the close of each open enrollment period for the employer's health insurance;
- 30 days after the close of each open enrollment period for the employer's Section 125 cafeteria plan; or
- September 30 of the reporting year.

When an employee terminates from the employer's group health plan, the employee must sign an employee HIRD form within 30 days of the date of termination. In the case of new hires, the employer must obtain a signed employee HIRD form from each new employee who either declines employer-sponsored health insurance coverage or declines to access other coverage through the employer's Section 125 cafeteria plan within 30 days after the close of the applicable enrollment period.

Call MDS Insurance Services, Inc., at (800) 821-6033 for more information and copies of the forms as needed. ■



# Is Human Bone Allograft Safe for the Management of Alveolar Defects? A Primer for Patient Consent

**ROBERT A. FAIELLA, DMD, MMSC**

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## Introduction

**A**lveolar ridge deformities occur due to a variety of etiologic factors, including inflammatory periodontal disease, trauma, congenital abnormalities, and tooth extraction.<sup>1</sup> Conventional and implant-supported reconstruction of the dentition demands attention to these limiting factors as we consider the requirements for augmentation of both soft and hard tissue by regenerative and reparative techniques. Clinical examples of bone allograft for immediate implant placement and repair of a complex ridge deformity can be seen in Figures 1a–f and Figures 2a–d.

In particular, autograft, allograft (human), alloplast (synthetic), and xenograft (bovine) have been used successfully alone or in combination for particulate bone augmentation. However, in spite of the reported benefits, limitations have been reported with each graft form.<sup>2</sup>

Although human bone allografts have been used in surgery for more than 100 years, the field of tissue banking has been a recent development. Legislation such as the Uniform Anatomical Gift Act has recognized the value of tissue donation for medical benefit. It is the intention of tissue banking as an industry to provide safe and effective tissue allografts for surgical implantation, but increased demand for tissue and rapid technological advances have created the need for oversight of tissue screening, procurement, storage, and distribution. The recent investigation of human tissue improperly recovered by

Biomedical Tissues Services, Ltd. (BTS) of Fort Lee, NJ, has heightened the need for clinicians to understand the oversight of tissue banks to allow safe and predictable recommendations for their patients, and to select an accredited bank when obtaining tissue for clinical use.

The American Association of Tissue Banks (AATB) was founded in 1976 as a scientific, nonprofit peer organization to establish the standards of technical and ethical performance in the industry and to maintain a program of accreditation for participating tissue banks. In addition, the AATB offers a program of certification of tissue bank personnel, requiring examination for the Certified Tissue Bank Specialist (CTBS) designation, and provides education and research in tissue bank safety, working closely with the FDA Center for Biologics Evaluation and Research (CBER).

Although the AATB provides the standards for safe and effective tissue procurement, processing, storage, and distribution, not all banks participate. There are an estimated 250 or more banks providing human tissue for transplantation, but only 97 are currently accredited by the AATB.<sup>3</sup> Of those banks providing bone tissue, most are involved with storage and distribution only; processing is currently provided by approximately 20 banks, due primarily to the technical and cost demands of processing human tissue.

In December 1993, the U.S. Food and Drug Administration (FDA) began hearings on federal regulations regarding the banking for human tissue for transplantation, primarily in response to the investigation of the sale of imported musculoskeletal tissue intended for transplantation without adequate donor screening and testing. As a result, approximately 40 FDA inspections of tissue banks were performed in 1994. Although

the FDA's findings revealed compliance among accredited banks, their call for increased awareness of safety issues in accepting allograft tissues for clinical use resulted in their issuing a final ruling in July 1997.<sup>4</sup>

### The Safety of Human Bone Allograft

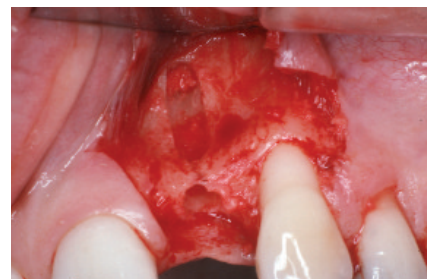
The use of allograft bone in dental and implant surgery is common, and tissue banks distribute in excess of 1.5 million allografts for transplant annually, demonstrating the need for concern regarding potential transmission of disease. In approximately 35 years of freeze-dried (lyophilized) bone allograft use for dental applications, there has not been a single report of disease transmission. However, although the risk for disease transmission is essentially nonexistent,<sup>5</sup> concern remains for some patients due to isolated reports of disease transmission in other allograft forms (such as hepatitis C and HIV in fresh-frozen bone for orthopedic use, and Creutzfeldt-Jakob disease in dura mater).

The AATB, through establishment of Standards for Musculoskeletal Tissue Banking, defines the safe procurement and processing of bone. Clinicians must be familiar with the screening and testing of donor tissue to ensure provision of safe tissue for their patients and to provide informed consent. For example, does the bank procure the tissue or obtain it from an outside source? Was the tissue harvested under sterile conditions or secondarily sterilized? If sterilized, was it done using irradiation, ethylene oxide, or other chemical agents? If it was sterilized with ethylene oxide, was it tested for residual contaminants? Since irradiation affects hydrated tissue differently than lyophilized tissue, was it irradiated before or after freeze drying? At what dose? Although many banks conform to standards, variations in protocol may exist and should be considered prior to purchasing bone for clinical use.

Testing for transmissible diseases, such as HIV and hepatitis, has received wide attention. Although all accredited banks test for HIV, as well as other diseases, certain testing methods have been approved by the FDA, such as polymerase chain reaction (PCR), enzyme immunoassay (EIA), and Western Blot test formats.



**Figure 1a.** A patient with a Bolton deficiency presents for replacement of the maxillary right lateral incisor.



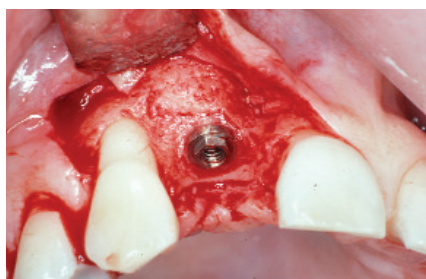
**Figure 1b.** The osteotomy site reveals a severe dehiscence due to buccal resorption of the ridge.



**Figure 1c.** The implant is placed with primary stability, but with a complete dehiscence to the apical extent of the implant.



**Figure 1d.** Bone allograft placed to attempt regeneration. A nonresorbable e-PTFE membrane was subsequently placed over the graft material.



**Figure 1e.** Complete repair of the buccal cortex to the level of the implant platform is demonstrated at the eight-month reentry procedure to retrieve the membrane.



**Figure 1f.** A 12-year post-treatment view of the restored case.

Landmark evidence from Mellonig et al. has demonstrated the inactivation of HIV by processing bone allograft for dental application in a demineralized, freeze-dried particulate form without additional secondary sterilization methods,<sup>6</sup> which likely partially explains the exceptional safety record in using this form of allograft bone in periodontal and implant surgical techniques.

A comprehensive list of testing methods for various disease entities can be found on the AATB Web site ([www.aatb.org](http://www.aatb.org)). Clinicians should be familiar with the test-

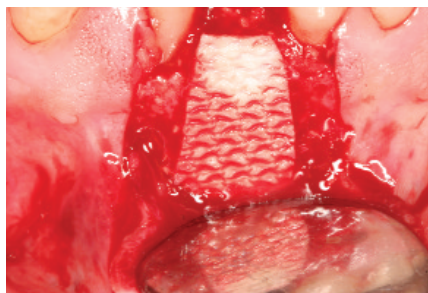
ing methods and related differences performed by their selected tissue banks.

### The Regulation of Xenografts

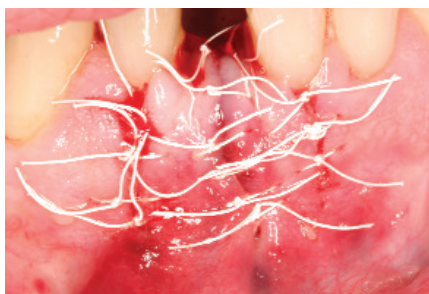
As mentioned previously, xenografts (bovine bone grafts) are often used by clinicians to address the management of osseous deformities. Although the use of these grafts is not regulated by the standards set forth by the AATB, the FDA provides oversight regarding the potential risks associated with this bone graft form. While the potential benefits are clear, use of xenografts raises concerns regarding



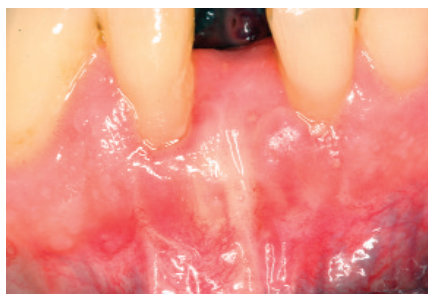
**Figure 2a.** A severe mucogingival defect with complete dehiscence of bone over the buccal aspect of the root.



**Figure 2b.** Following extraction, the severe ridge deformity is treated with bone allograft and resorbable membrane.



**Figure 2c.** A rotated double-papilla graft is positioned over the membrane to both cover the graft and correct the mucogingival defect.



**Figure 2d.** The three-month posttreatment result reveals both hard- and soft-tissue correction of the deformity.

the potential infection of recipients with both recognized and unrecognized infectious agents, and potential subsequent transmission to the human population. Ongoing specific concerns regarding potential cross-species infection by retroviruses, which may be latent and manifest years later, have caused xenografts to be subject to regulation by the FDA.<sup>7,9</sup>

Clinicians should be aware that selection of a bone xenograft as a substitute for an allograft demands attention to the appropriate concerns, albeit extremely low, that allow an informed patient consent.

### The Responsibility for Clinical Record Keeping

One important issue for clinicians using allograft bone is the tracking of the graft, compliance with tracking methods, and the legal responsibility for maintaining records. In 1995, the FDA and the AATB held a joint Consensus Conference in Bethesda, MD, on the Regulation of Human Tissue Intended for Transplantation. Of the many topics discussed, it was noted that clinicians, and not tissue banks alone, are ultimately responsible for tissue tracking, and must maintain a record of the tissue (type and amount), source (bank name and address), tissue identification number(s),

expiration date (if applicable), patient name and identifier (such as Social Security or record number), transplantation site, date of the transplantation, name of the surgeon placing the tissue, and name of the person preparing the tissue for use (see Table 1). In addition, those records should be maintained for a period of up to 10 years, in accordance with the most recent AATB standards. Most banks provide tracking forms to capture the information, and clinicians should maintain a copy of the form in the office as a record prior to returning it to the bank by mail.

**Table 1**  
**Suggested Clinical Record for Allograft Recipients**

1. Name and address of the source tissue bank
2. Type and quantity of tissue, and tissue identification number
3. Patient name and identifier (record number or Social Security number)
4. Transplantation site and date
5. Name of the ordering physician or dentist
6. Name of the person preparing the tissue, if applicable

It should be noted that the precedent for FDA tracking requirements can be found in the Safe Medical Devices Act of 1990 and the Medical Device Amendments of 1992, both of which imposed strict requirements to ensure that a device manufacturer can locate a medical device after distribution if a patient notification or recall is required. We should expect no less for surgical tissue implantation.

Additionally, the Joint Commission for the Accreditation of Health Care Organizations (JCAHO) has proposed tracing human tissue allografts in their standards for its *Accreditation Manual for Pathology and Clinical Laboratory Services*.

### Summary

Allograft bone has been used safely and extensively in dental and implant surgery for more than 35 years, and increased federal regulation only serves to enhance an exceptional safety record. However, proper selection of tissue from accredited banks by a knowledgeable clinician, and compliance with tracking and record-keeping recommendations, will provide the ultimate benefit to the patients who trust our clinical judgment for their well-being. ■

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# Computer-Guided Implant Dentistry

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**C**omputer-guided minimally invasive implant treatment promises to revolutionize the way we practice implant dentistry. This new technology allows implants and associated restorations to be precisely placed at the same procedure directly through the gingiva in an hour or less. Since there is no incision, there is minimal postoperative discomfort or swelling and no sutures.

The typical dental implant approach introduced in the early 1980s requires two surgeries<sup>1</sup> and use of a removable bridge or denture for a half-year or more. In 1997, it was shown that implants could be placed and restored in a single visit.<sup>2</sup> But this procedure, known as immediate loading, takes a full day of coordinated surgical, restorative, and laboratory interaction to perform. However, in 2002 the concept of immediate loading with computer-guided techniques was introduced in Leuven, Belgium.<sup>3</sup> The early treatments were limited to the edentulous maxilla and required a full-thickness mucoperiosteal flap. Later, the procedure was refined to include flapless implant placement<sup>4</sup> as well as partially edentulous conditions in all areas of the mouth.

Besides the obvious advantages of a less invasive procedure and shorter patient visit for implant placement, there are not-so-obvious advances in precision and patient safety now achievable. Computed tomography (CT) scans have been available for implant dentistry for decades,<sup>5</sup> and in 1996 advances in computer-assisted treatment planning allowed the practitioner to analyze skeletal architecture prior to implantation.<sup>6</sup> But new to the field are low-radiation-dose scanners known as cone beam scanners.<sup>7</sup> Currently, both medical scanners and cone beam scanners are used for implant treatment planning. While both scan types are useful for viewing available bone in a three-dimensional format, only a radiographic guide coupled with either scan allows for full visualization of the bone relative to the planned replacement tooth or teeth.

The guided software technology goes a step further, actually transforming the scan of the now virtual radiographic guide into the actual surgical template. Once the surgical template is produced, it can be placed on the mounted cast that the radiographic guide was produced on, and this cast is then effectively retrofitted with implant replicas in the planned positions. For implant restoration predictability, this is profound. All previous implant treatment sequences, with however much planning was invested, involved the placement of implants, but only after placement—when implant-level impressions were made, models produced, and then mounted—did the dentist and technician first see the subtleties of implant alignment influencing design and sometimes compromise of the intended restoration. With the ability now to transfer the diagnostic work-up of the radiographic guide through virtual planning into a physical template, the implant-level model is produced with high precision before the implants are actually placed. This is a tremendous advantage in restorative predictability and confidence on both routine and advanced cases. The ability to visualize three-dimensional orientation of implants with axial trajectory interfacing with the planned restoration is as valuable for the precision in planning and at least equal to the minimally invasive patient advantages. The ease of incorporating a high-quality radiographic guide into CT scans has the potential to expand CT scan utilization and value from the scans to achieve precise treatment results.

An essential element of the procedure is the production by rapid prototyping from a 3-D computed tomogram of a stereolithographic template containing precision drilling sleeves. Several manufacturers provide the techniques and armamentarium to perform the procedure, but the two major systems are known as SurgiGuide™ by Materialise of Glen Burnie, MD, and NobelGuide™ from Nobel Biocare of Yorba Linda, CA. This report will describe the computer-guided implant procedure using the NobelGuide system.

The first step in the implant procedure is the fabrication of a custom-made radiographic guide containing the tooth or teeth to be replaced and incorporating gutta-percha markers for computer registration and inspection windows for verification of

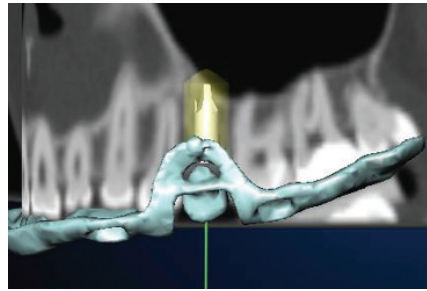


**Figure 1.** A radiographic guide for three missing teeth, which the patient will wear during the CT scan, incorporating gutta-percha markers and inspection windows to verify accurate intraoral seating.

accurate seating (see Figure 1). Then the patient has a CT scan with the radiographic guide in place intraorally. A second scan is performed of the radiographic guide only. From these CT scans, the radiologist provides the dentist with a computer disc of Dicom images, which are loaded into the 3-D planning software program. The program joins the radiographic guide with the patient's bony anatomy using five to six radiopaque gutta-percha markers that were incorporated into the radiographic guide during its fabrication. This allows the practitioner to precisely visualize 3-D images of the patient's bone and adjacent teeth (see Figure 2a), the planned tooth or teeth to be replaced, and the space between the bony surface and intaglio surface of the virtual tooth or teeth representing the thickness of the soft tissue (see Figure 2b). Because of the double scanning technique (radiographic guide and patient), each element can be viewed separately or together with others in the planning software.

For the fully edentulous arch, fabrication of the radiographic guide is quite straightforward, using a denture or duplicated denture incorporated into the scan. For the partially edentulous arch, design concepts unique to this technology must be learned. For replacing one tooth or several teeth, the design of the radiographic guide must not only consider capture of required diagnostic data, but also incorporate the block-out and structural requirements of the surgical template for draw, stability, and strength. This is because the scanned data of the radiographic guide is also the foundation for production of the physical surgical template (see Figure 3a).

The dentist, using the software that contains a library of implants and abut-

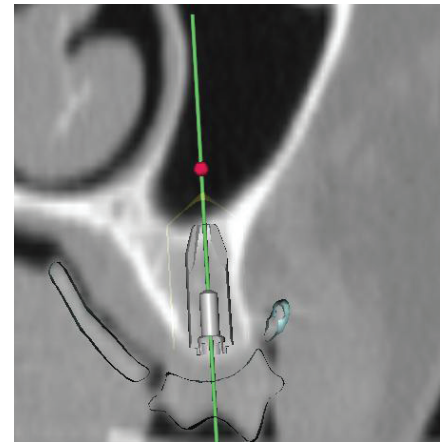


**Figures 2a (left) and 2b (right).** Buccal view (2a) and proximal view (2b) showing the virtual radiographic guide as scanned with virtual implant and planned restoration with available bone and gingival space.

ments, now precisely plans the implant placement relative to the bone, soft tissue, and tooth or teeth to be replaced. Essentially, the surgery and restoration are virtually planned (see Figures 4a-c). The planning information is emailed to the rapid prototyping facility, where a stereolithographic surgical template incorporating precision titanium drilling sleeves is fabricated (see Figure 3a). The sleeves incorporate all of the 3-D planning for implant trajectory and vertical position.

From this surgical template, the laboratory is able to preoperatively fabricate an accurate stone model (see Figure 3b) incorporating soft-tissue anatomy and implant position using implant replicas. From this model, a temporary or definitive prosthesis can be fabricated for immediate placement at implant insertion. The significance of this advance—being able to produce an accurate implant-level model before implant placement—cannot be overstated.

The patient is now ready to have his or her implants placed, which generally takes 30 to 60 minutes depending on the number of implants. First, the surgical

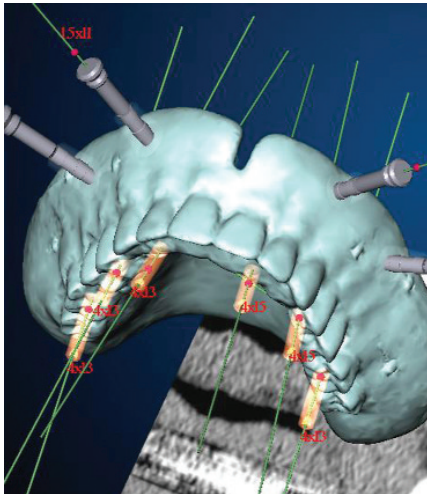


template is secured to place with a surgical index and anchor pins (see Figure 5). Then, using a series of specially designed burs and drilling guides, which precisely fit into the sleeve or sleeves of the surgical template, the implant site is prepared flapless through the soft issue and the implant (or implants) is placed in the position as planned in the 3-D software. Computer-guided implant placement is much quicker and more precise than placement by freehand drilling. Figure 6 shows an immediate postoperative complete arch restoration with radiograph.

When a definitive prosthesis is fabricated for multiple implant restorations, special abutments are used that allow for the ever-so-slight interimplant differences that can occur. With a provisional prosthesis, which is rapidly becoming the preferred method, each tooth or section is secured directly to the implant using temporary abutments and then teeth or sections are joined together intraorally for passive fit using autopolymerizing acrylic. Because the implant sites are so precisely prepared, the prostheses can be placed immediately at implant insertion.



**Figures 3a (left) and 3b (right).** Computer-generated stereolithographic surgical template (3a) incorporating titanium sleeves which will hold drill guides that direct the drills and implants to the exact virtually planned intrabony position from which (3b) an exact presurgical laboratory model can be fabricated for production of the planned restoration.

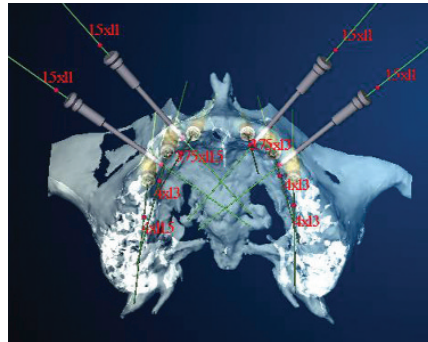
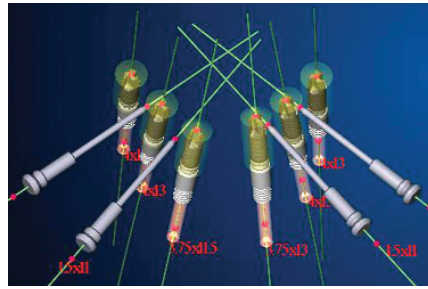


**Figures 4a-c. Computer-planned complete arch treatment showing: (4a, above) virtual guide and implant trajectory relative to planned teeth; (4b, top right) virtual implants without guide and bone demonstrating non-interfering anchor pin relationship; and (4c, lower right) relationship of implants and anchor pins to bone.**

Patients with partially edentulous restorations are advised to avoid using their new prosthesis for three months in the mandible and six months in the maxilla while osseointegration takes place. For complete arch restorations, the patient is advised to avoid any type of diet that would place undue strain on the teeth and implants during the osseointegration period. However, fully edentulous restorations incorporate more implants that are cross-arch splinted, so they are less susceptible to forces of mastication. It should be noted that while this technique makes immediate provisionalization possible and easier to accomplish, it is a separate consideration; the planning and precision of placement advantages alone justify this procedure even if a delayed loading protocol is used. The delayed restoration will still be facilitated with use of this technology.



**Figure 5. Six-implant surgical template held in place with four anchor pins over intact gingiva. All drilling and implant placement will take place through titanium sleeves.**



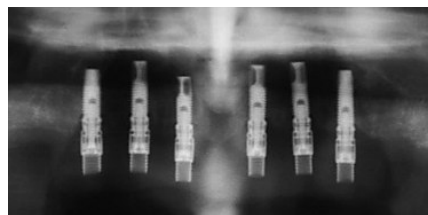
The ideal patient for this procedure is one who exhibits adequate bone and attached soft tissue in the edentulous area and who may not be able to tolerate an extended surgical procedure. Since the current drills are 10 mm longer than standard drills, the patient must be able to open wide enough to accommodate the additional length. Cost-benefit considerations must take into account the cost of the CT scan, software acquisition, planning time, and laboratory costs associated with the fabrication of customized radiographic guides and drilling templates and immediate provisional restorations. At the same time, the precision of planning and delivery has the potential to reduce some laboratory costs through more predictable restorations using stock rather than customized components. Any disadvantages may be offset by improved surgical planning, good cooperation with

the referring dentist, and optimization of esthetics, as well as significantly reduced surgical time and discomfort, and a speedy recovery for the patient.

With these planning and delivery advances of computer-guided implant dentistry, it has been shown that more clinical outcomes have gone from “clinically acceptable” to “perfect” with a high degree of confidence. This is not a technology to be reserved for difficult or sophisticated treatments, but rather a way to optimize every treatment possible. ■

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**Figure 6. An immediate complete-arch implant restoration with radiograph. Note anchor pin perforations in the vestibule.**



# MDS Conducts Major Membership Survey



**W**hat do you, as a member dentist, think about the Massachusetts Dental Society (MDS)? What is your opinion of the services and benefits offered, and how well does the MDS represent the profession? The MDS Council on Membership recently asked members these questions and more on its 2007 Membership Survey (the last such survey was conducted in 2005). The comprehensive survey was designed to better understand the needs of members and how the Society can become an even more important component of your professional life.

To ensure an accurate representation of the membership, the survey was developed and administered by an independent third-party company, Opinion Dynamics of Cambridge, MA. Members were asked to complete the 45-question survey online between the months of April and May. A representative sample was achieved for the survey, and the margin of error for all results is +/- 4.4 percent.

Some of the major results from the survey are as follows:

- Seventy-eight percent of all members say they are very satisfied or somewhat satisfied with their MDS membership, compared to 75 percent in 2005. Satisfaction is correlated with years of service: 51 percent of members who graduated before 1968 are very satisfied, compared with 40 percent of those who graduated after 1988.
- Regarding the continuation of their membership, 88 percent of members say they are extremely likely or very likely to continue. In addition, 51 percent say they strongly agree with the statement "I believe membership in the MDS is valuable."
- The primary reasons for continuing membership are: "Communications from MDS to keep current on practice issues"; "Organization derives strength in numbers"; "Legislative representation"; and "Yankee Dental Congress."

## Priorities for the MDS

- There is a strong consensus that the MDS should continue to focus on working with dental insurance companies to modify policies, lobby on important issues, offer continuing education programs, and promote oral care to the public through a media campaign.
- Female dentists are more concerned than male dentists about community outreach and programming and about promoting oral care. Male dentists place more emphasis on increasing the number of dental chairs for hygiene schools.
- Older dentists place a greater emphasis than younger dentists on enticing dental assistants into the profession. New dentists are relatively more likely to be concerned with group buying arrangements for business services.

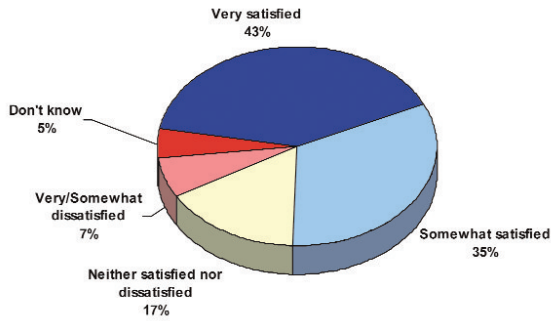
## Career Challenges and Direction of the Profession

- High practice overhead, state and federal regulations, and growth of managed care rank as the top three career challenges for members.
- Nearly one-third of dentists graduating after 1997 list graduating with high debt as their top challenge.
- Members feel that the overall direction of the profession of dentistry is positive, with 85 percent saying the direction is very positive or positive.

## Public Awareness Campaign

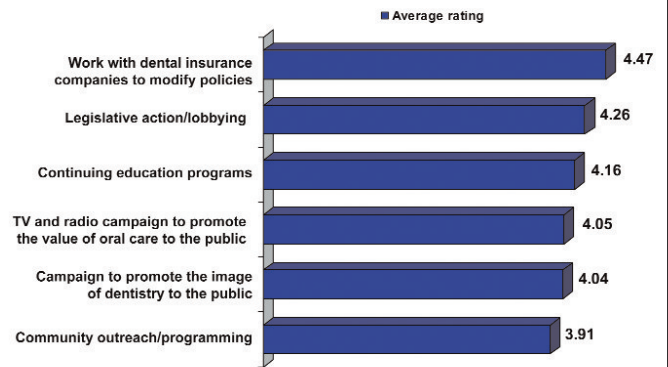
- Sixty-one percent of members say the MDS Public Awareness campaign is very effective or somewhat effective.
- Satisfaction with the advertising campaign focusing on oral cancer is very high, followed by the ads promoting the relationship between oral health and overall health, and then the ones supporting the use of mouthguards.
- Female dentists are more likely than male dentists to support public awareness campaigns educating teenagers and parents about soda consumption, mouthguard use, chewing tobacco, and other topics.

## Overall Satisfaction



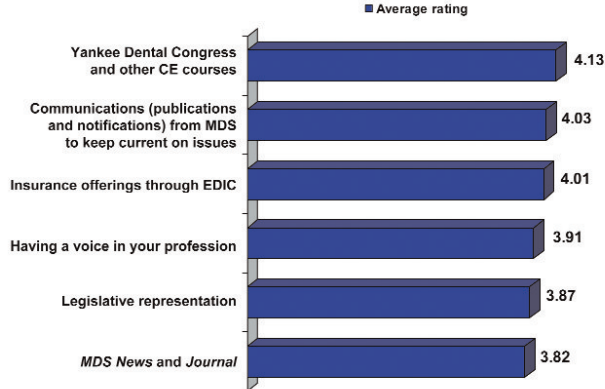
## Financial Priority Ratings for MDS

(On a scale of 1 to 5, with 5 being the highest priority)

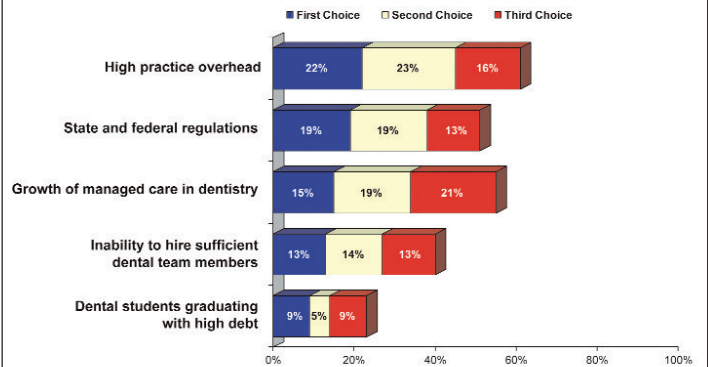


## Satisfaction Ratings

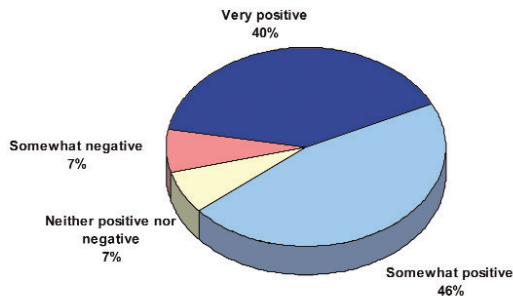
(On a scale of 1 to 5, with 5 being the highest priority)



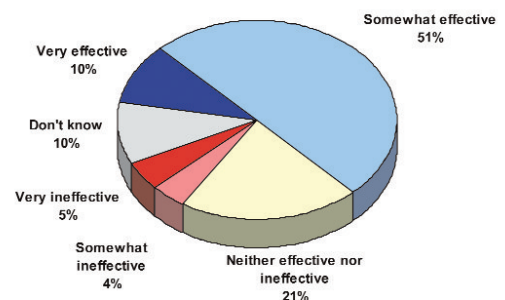
## Top Career Challenges



## Overall Direction of the Profession



## Overall effectiveness of MDS public awareness campaigns in positioning MDS as the resource for oral health information?



Source: Opinion Dynamics Corporation

“Surveys are an excellent tool for gaining a better understanding of what members want and how the Society can meet their needs,” says Robert Leland, DMD, chair of the Council on Membership.

“This survey will be distributed to the Board of Trustees and all councils and committees for review and use when making programming and policy decisions.”

To review the full survey results, visit [www.massdental.org/professionals](http://www.massdental.org/professionals) or contact the Membership Department at (800) 342-8747, ext. 243. ■



# Immediate Implant Therapy in Clinical Practice: Single-Tooth Replacement

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Once viewed as an esoteric treatment option, implant therapy has demonstrated long-term predictability at least equal to that of more “conventional” treatment modalities. The continued evolution of implant surface technology and restorative options has made implant therapy the treatment modality of choice in many, if not most, clinical situations. It is, therefore, only natural that the role of immediate implant therapy continues to expand. Proponents of immediate implant therapy advocate its use at the time of tooth removal or, in a partially or fully edentulous arch, to meet a variety of clinical challenges.<sup>1-10</sup>

*The goal of this article is to discuss the clinical realities of single-tooth immediate implant therapy and how best to utilize such treatment in daily practice.*

## Definitions

When discussing immediate implant therapy, it is important to differentiate between immediate implant placement at the time of tooth removal, immediate temporization of implants (in either fresh extraction sockets or previously edentulous areas without functional occlusion), and immediate functional loading of implants placed in fresh extraction sockets or previously edentulous areas. Each of these scenarios presents its own unique challenges and demands for maximization of functional and esthetic outcomes of treatment.

## Patient Examination and Work-Up

Prior to the initiation of immediate implant therapy, it is imperative that appropriate examination, diagnosis, and case work-up be performed.

A patient who presents with a fractured maxillary central incisor (and an otherwise intact dentition with no periodontal or occlusal concerns) may require nothing more than a clinical and radiographic examination prior to the initiation of immediate implant therapy. However, patients demonstrating a greater degree of dental pathology, whether it be carious, periodontal, endodontic, orthodontic, or occlusal in nature, must undergo a thorough examination and assessment, including facebow-mounted models. The periodontist and the restorative dentist are able to examine these models and, in conjunction with information gained from their clinical examinations, formulate a comprehensive, unified treatment plan for the patient. Failure to do so will result in less-than-ideal treatment outcomes.

For our discussion regarding immediate implant therapy in single-tooth sites, the assumption is made that the aforementioned examination has been carried out and that all other dental problems have been appropriately managed for the patient in question.

## Site-Specific Examination and Treatment Planning

Soft-tissue examination should include an assessment of soft-tissue health to ensure that active gingival inflammation is not present, as well as an evaluation of soft-tissue thickness and the dimensions of available attached keratinized tissue. These factors are important in assessing the expected stability of the soft tissues following implant placement, temporization, and final restoration. Hard-tissue examination must include an assessment of both the quality and the quantity of available bone for



**Figure 1. A patient presents with a hopeless prognosis for a fractured tooth #8 and fairly thick, not highly scalloped soft tissues.**



**Figure 2. A second patient presents with a hopeless prognosis for tooth #8. Note the thinner, more highly scalloped soft tissues than those of the patient in Figure 1. These tissues are much more labile following surgical insult.**

implant placement. In instances of immediate implant insertion, the amount of bone available apical to the extraction socket for implant stabilization is not as crucial as the extent of alveolar bone that will be engaged by the implant after its placement, including the lateral walls of the extraction socket at its most apical extent where the diameter of the implant will exceed that of the extracted tooth.

At least as important as the above-outlined assessment criteria is the patient's phenotype. Tissue phenotype defines the envelope of postoperative response. A patient with a blockier, less-scalloped phenotype demonstrates thicker hard and soft tissues macroscopically than its thinner, more highly scalloped counterpart (see Figures 1 and 2). The histological makeup of the soft tissues in a patient with a blockier, less-scalloped phenotype demonstrates a larger percentage of dense gingival connective tissue and a relatively lesser percentage of epithelium and rete pegs than a more highly scalloped phenotype. Alternately, histological examination of soft tissues from a patient with a thin, highly scalloped phenotype demonstrates a lesser percentage of gingival connective tissue and a higher percentage of epithelium and rete pegs.

The alveolar bone in patients with a blockier, less-scalloped phenotype demonstrates both a greater thickness and a larger percentage of marrow than its thinner, highly scalloped counterpart, which presents with thinner, more delicate bone and a lesser marrow component.

As a result of the differences in histological characteristics between the two phenotypes, the postoperative response of the blockier, less-scalloped phenotype is characterized by greater hard- and soft-tissue stability and less resorption than its labile, more highly scalloped counterpart. Such considerations are

extremely important when contemplating tooth extraction and immediate implant insertion in the esthetic zone.<sup>10</sup>

### **Extraction Technique**

Ideally, teeth in the esthetic zone should be extracted without reflecting a mucoperiosteal flap. This goal is attainable in the vast majority of cases utilizing appropriate periostomes, piezosurgery, or a bone extraction system that utilizes a post tapped into a fractured root, impression taking, and removal of the root through extrusion of the post PA torque system. When absolutely necessary, only a palatal/lingual flap should be reflected so as to maintain the integrity of the buccal soft tissue.

### **The Question of Infection**

The presence or absence of periapical or periodontal infection at the time of tooth removal does not preclude immediate implant placement. The clinician must instead consider the extent and severity of the infection. If the periodontal or periapical infection has undermined the bone necessary to attain ideal implant positioning, the tooth is removed and appropriate regenerative therapy is performed. An implant is placed in a second-stage procedure. If the infection has undermined bone which is crucial to the maximization of esthetic treatment outcomes, or should the soft tissues which are present be unstable due to a fistula, the tooth is once again removed and appropriate regenerative therapy is performed without immediate implant placement.

The presence or absence of periapical or periodontal infection is never a contraindication to regenerative therapy at the time of tooth removal following appropriate debridement. Failure to perform the necessary regenerative therapy will result in significant resorption and

hard- and soft-tissue changes, esthetic compromise, and the need for additional surgical interventions. The literature has conclusively demonstrated that guided bone regeneration (GBR) therapy may be successfully performed in the presence of periodontal and/or periapical infection.

The technique and materials utilized to effect appropriate regenerative therapy in the esthetic zone are wholly dependent on the residual extraction socket morphology. The goal of such regeneration is not merely to attain adequate bone for implant placement. Rather, complete regeneration of prepathologic bone morphology must be seen as the only acceptable treatment outcome. In order to predictably attain this goal, the clinician must understand the indications, contraindications, and limitations of various regenerative approaches.

If the buccal alveolar bone of the extraction socket is intact, but the extraction socket defect is not a space-maintaining defect due to extensive loss of the palatal and/or interproximal bone, it is crucial to use a titanium membrane in such a situation to ensure the regeneration of prepathologic alveolar ridge morphology. Regardless of the consistency of the graft materials placed beneath the membrane, if the membrane is not titanium reinforced and the space is non-space-maintaining, some membrane collapse will occur, compromising the final hard-tissue regenerative result.

Unless adequate bone is present apically and laterally to ensure adequate primary stability of the implant, the implant must be angled in such a manner as to engage the palatal wall of the extraction socket. Either approach, when performed appropriately, will result in an implant that is easily restored in an ideal manner to maximize esthetic treatment outcomes.

The precise course of therapy following implant placement is dependent on a combination of patient phenotype and defect morphology.

When a patient presents with a blocky, less-scalloped phenotype and the alveolar buccal ridge is intact, two possibilities present themselves. If the horizontal defect dimension (HDD), defined as the horizontal distance between the outer aspect of the implant and the buccal alveolar ridge, is less than 2 mm, no grafting materials are placed and the implant is

temporized at the time of placement, unless other factors such as a deep overbite or a severe parafunctional habit preclude temporization. If immediate temporization is not accomplished, a healing cap is placed so that the implant is not submerged. In the vast majority of situations, this implant will be temporized at the time of placement. If the HDD is greater than 2 mm, the implant is covered with a resorbable membrane, and the implant is not temporized at the time of placement.

When the patient presents with a thin, delicate, highly scalloped phenotype, the implant is placed and covered with a resorbable membrane. This implant is submerged beneath the soft tissues following rotation of a palatal pedicle flap. Due to the labile nature of the buccal hard and soft tissues in such a scenario, the implant is placed at the time of tooth removal but is never temporized immediately, regardless of the dimension of the HDD.

When a patient presents with a dehiscence of the buccal alveolar ridge that is 5 mm or less in mesiodistal expanse, the implant is placed at the time of tooth extraction, and graft material and a titanium-reinforced membrane are employed following flap reflection and rotation of a palatal pedicle flap.<sup>11</sup> The implant will be uncovered and temporized approximately six months after regenerative therapy has been performed. If the buccal dehiscence defect measures greater than 5 mm mesiodistally, regenerative therapy is performed without implant placement and the implant is placed six months following the regenerative therapy.<sup>12</sup> In such a situation, the implant will most probably be temporized at the time of its placement.

In summary, care must be taken to preserve the remaining alveolar bone, to recognize when such bone is missing, to identify sites that are at risk for loss of existing alveolar bone if certain treatment protocols are not utilized, and to regenerate lost bone appropriately. This is especially important in the interproximal areas. Once interproximal bone is lost, its regeneration in single-tooth sites is unpredictable; this often leaves the restorative dentist having to perform “porcelain gymnastics” to fill the interproximal space, or requires the patient to understand the situation and accept an unesthetic interproximal space.

## Implant Selection and Treatment Protocols

No implant configuration presently exists that is the ideal choice for immediate implant insertion and tooth replacement in all clinical situations. Factors to be considered when selecting an implant for use in a specific situation include:

- **Implant surface.** Various implant surfaces help promote osseointegration at an earlier time following insertion, thus “narrowing the window of vulnerability” following immediate implant placement and loading.
- **Implant configuration.** A tapered implant often offers advantages when placed immediately following tooth removal in the maxillary anterior region, as it lessens the chances of apical alveolar bone fenestration at the time of implant placement.
- **Implant neck diameter.** The appropriate neck diameter must be selected both to allow fabrication of an esthetic restoration to replace the tooth in question and to maximize the interproximal bone between the implant and adjacent teeth. An implant neck that is too wide naturally presents problems with both of these considerations. However, an implant neck that is too narrow will mandate either the use of a ridge lap crown with its inherent esthetic compromises or the need to place the implant further apical to the osseous crest, leading to the need to place a shorter implant and the development of additional bone loss following abutment insertion and implant restoration.
- **Hard- and soft-tissue stability around the implant.** If the implant does not have to be countersunk for esthetic reasons, the most ideal implant configuration would allow for an implant abutment joint at least 1.8 mm coronal to the osseous crest, so as to avoid alveolar crestal cupping following abutment attachment. This arrangement also provides the greatest degree of soft-tissue long-term health and stability, helping to maintain appropriate esthetics in the area. If the implant must be countersunk due to esthetic considerations, such factors are less significant.
- **Restorative treatment options.** While the ability to attain the

desired functional esthetic result is of paramount importance, other considerations influence implant selection when immediate implant insertion and temporization are to be carried out. Implant temporization must be able to be performed in a simple, predictable manner at the time of implant insertion. This includes ease of abutment insertion, ease of fabrication of a temporary crown, and the ability to control the cement line and efficiently remove excess cement at the time of temporization. If equal treatment results may be obtained utilizing different methods, the cost of the necessary abutment and crown are also considered when determining the appropriate treatment option. However, it is imperative that two options are truly equal in predictability and esthetic outcome if they are to be assessed based on their relative costs.

- **The existence of impartial evidence of long-term clinical success in refereed scientific journals.** Clinicians today are faced with an ever-expanding number of implant options. Unfortunately, manufacturer claims are not always substantiated by appropriate impartial documentation. It is imperative that any implant approach chosen be able to provide such substantiation. If two implant approaches present with equal predictability, it is only logical to choose the simpler of the two approaches. Should two implant approaches demonstrate equal predictability and simplicity, it is understandable to choose the less expensive of the two treatment options. As conscientious clinicians, we must honestly assess whether two given approaches are truly “equal” and whether such equality has been demonstrated through impartial studies in refereed journals.

Examples of treatment approaches that meet these criteria in many situations include an internal synOcta attachment implant and a tri-sleeve internal attachment implant.

With an internal synOcta attachment implant (Straumann and Co. of Andover, MA), following tooth removal, defect debridement, and implant placement, one of two treatment approaches is utilized for immediate temporization.

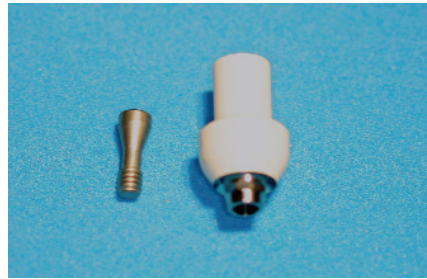


In a patient presenting with a blockier, less-scalloped phenotype, a solid abutment is inserted at the time of implant placement. A temporary crown form is filled with acrylic and placed on the solid abutment. Once the acrylic sets, the crown is removed and placed on a laboratory analog. Final crown contours and marginal adaptation are attained extraorally on the laboratory analog. The crown is filled with a thin layer of cement and placed on the laboratory analog so as to extrude all excess cement. The crown is then brought to the mouth and inserted on the solid abutment. Care is taken to remove any excess cement that is present. Following completion of osseointegration, an impression is taken, and a final crown is fabricated and cemented following conventional protocols for the internal synOcta attachment implant.

Patients presenting with a thinner, more highly scalloped phenotype situation resulting in the implant having been placed deeper interproximally in the subgingival are treated utilizing a meso abutment (see Figure 3). This abutment is inserted into the implant, and the gingival margin is scribed with a sharp instrument. The meso abutment is placed on a laboratory analog and is prepared as the clinician would prepare a tooth for acceptance of a single crown. The meso abutment is replaced in the mouth, and a temporary crown is filled with acrylic and brought to the mouth. The meso abutment and temporary crown are removed from the mouth and placed on a laboratory analog. Final crown contours and marginal adaptation to the meso abutment are attained extraorally. The meso abutment is inserted into the implant, and the temporary crown is cemented onto the meso abutment with the technique previously described, following occlusion of the access hole of the meso abutment with a Skube and Panavia (see Figures 4–10).

Use of the meso abutment allows the clinician to control the cement line of the temporary crown and easily remove excess cement following cementation. In addition, the wide diameter of the meso abutment allows the clinician to control the submergence profile of the temporary restoration and support the soft tissues during the early stages of healing. Following completion of osseointegration, an implant-level impression is

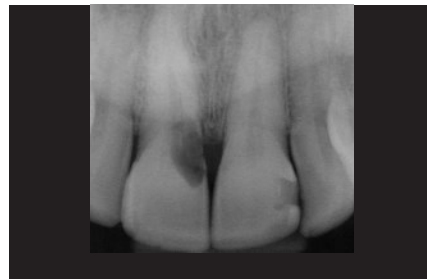
**Once interproximal bone is lost, its regeneration in single-tooth sites is unpredictable; this often leaves the restorative dentist having to perform “porcelain gymnastics” to fill the interproximal space.**



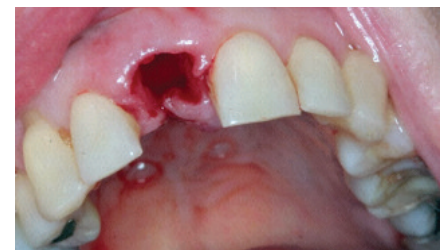
**Figure 3.** A view of a meso abutment.



**Figure 4.** A patient presents with a fractured and hopeless tooth #8.



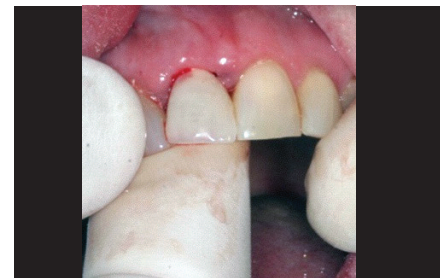
**Figure 5.** A radiograph of the patient in Figure 4 demonstrates extensive resorption of the root of the hopeless tooth #8.



**Figure 6.** The tooth has been extracted in a flapless, minimally traumatic manner. The alveolar walls of the extraction socket were preserved.



**Figure 7.** Following implant placement, a meso abutment is contoured and inserted into the implant.



**Figure 8.** A temporary crown is shaped, relined, and cemented to the meso abutment.



**Figure 9.** Seven days post-therapy, the preservation of the interproximal soft-tissue papillae and the developing soft-tissue contours around the temporary crown are evident.



**Figure 10.** Four weeks post-implant insertion and temporization, the peri-implant soft-tissues demonstrate the desired contours.



**Figure 11. A view of a stock temporization abutment. This abutment will not afford either access to the cement line or appropriate subgingival soft-tissue support.**

taken, and an abutment and crown are fabricated and inserted following accepted protocols.

The above approaches are simple and highly predictable. The only disadvantage to the outlined treatment modality is the fact that a synOcta internal attachment implant cannot be utilized for replacement of narrow teeth, as its mesiodistal neck dimension is 4.8 mm.

With a tri-sleeve internal attachment implant (Nobel Biocare of Yorba Linda, CA), following tooth removal and implant placement, the treatment approach described below may be utilized for immediate temporization.

In a patient who presents with a blockier, less-scalloped phenotype, a modified plastic temporary abutment is employed. The plastic abutment supplied by the manufacturer is modified through the addition of peak material to attain a greater width to the apical area of the abutment (see Figures 11 and 12). This abutment is now utilized in the same manner as the previously described meso abutment. It is inserted in the implant, the gingival margin is scribed, and the abutment is placed on a laboratory analog and prepared accordingly prior to final temporary crown fabrication.

This approach eliminates the problem of a deep subgingival interproximal cement line at the time of cementation. The crown is now cemented with temporary cement utilizing the technique already described for the synOcta internal attachment implant. A final crown is fabricated and inserted following completion of osseointegration.



**Figure 12. An example of a modified temporary abutment which allows creation of a custom accessible cement line and control of the submergence profile for temporary restoration.**

The advantages of the tri-sleeve internal attachment implant in these situations is the availability of implants with 3.5 mm and 4.3 mm neck widths, thus affording the opportunity to immediately place implants with temporary crowns at the time of removal of narrower teeth. The disadvantage to this treatment approach is the need to modify the temporary abutment that is available from the manufacturer.

### **The Influence of Patient Phenotype on Abutment Selection**

Procera Zirconia abutments offer significant esthetic advantages, especially in patients with thin, highly scalloped phenotypes and the resultant very thin buccal soft tissues. In addition to the greater translucency offered by such abutments and crowns over conventional metal abutments and porcelain fused to gold crowns, Zirconia abutments may be custom-stained. This is especially important should any tissue recession occur at the crown margin. Such recession is certainly possible in a highly scalloped phenotype patient as the soft tissues are more labile than their less-scalloped counterparts, as previously described.

### **Conclusion**

Utilized appropriately, immediate implant placement and temporization for replacement of single teeth in the esthetic zone is highly predictable and offers a plethora of advantages for the patient. The number of surgical insults and the total time of therapy are decreased. Immediate implant temporization also

affords the opportunity to support and control soft-tissue healing, thus enhancing final esthetic treatment outcomes. However, it is imperative that appropriate casework and diagnosis be carried out prior to the initiation of such therapy and that implant selection not be based on manufacturer claims or financial considerations, but rather be grounded in sound biologic principles, independent research, and clinical reality. ■

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# The 2007 American Heart Association Guidelines for the Prescription of Antibiotic Prophylaxis: A Brief Overview

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## Introduction

Since 1955, the American Heart Association (AHA) has recognized the association between transient bacteremia caused by dental procedures and the risk of acquiring infective endocarditis (IE).<sup>4</sup> Over the years, recommendations and guidelines for antibiotic prophylaxis for prevention of IE have been constantly reviewed and revised. The most useful guidelines in medicine and dentistry are dynamic and constantly in flux as more evidence-based information becomes available. The latest revision of the AHA guidelines was published in the scientific journal *Circulation* in April 2007.<sup>3</sup>

This article will present a review of the evolution of the AHA guidelines from 1955 into the latest version as they relate to dental procedures. It will also discuss the medicolegal ramifications of adhering to guidelines or local consultations by the dental practitioners. Every dentist must be aware of these updates and educate their patients and other health care professionals as to the rationale and recommendations.

American Heart  
Association.   
*Learn and Live.*



## Pathophysiology of Infective Endocarditis: How Does It Relate to Dental Procedures?

Certain cardiac conditions (developmental or acquired) leave the endothelium of cardiac valves subject to a turbulent flow of blood, which can disrupt the endothelial lining, leading to a deposition of platelets and fibrin to produce a nonbacterial thrombotic endocarditis (sterile vegetations) that may in turn lead to colonization of these lesions by bacteria. Initiating factors include prosthetic heart valves, mitral valve prolapse with regurgitation, and congenital ventricular septal defects. The presence of bacteremia places these vegetations at a risk of infection, which will lead to infective endocarditis (IE), a condition of substantial morbidity and mortality that requires aggressive and prolonged treatment. *Viridans group streptococci* (VGS) is the most common bacteria implicated in causing IE; this group of bacteria possess virulence factors that allow them to adhere to sterile vegetations followed by multiplication causing IE.

The oral cavity contains more than 300 different species of bacteria. These include multiple strains of VGS. Transient bacteremia following dental procedures such as rubber dam placement and extractions, as well as normal activities such as tooth brushing, flossing, and chewing, have been well documented. It is important to note that there have been no prospective studies that document the relationship between dental procedures and IE. The documented studies have been animal studies or retrospective human studies, some of which lack strong temporal relationship between the incident of IE and the dental procedures. Thus, there is no scientific evidence of a direct cause-effect relationship between bacteremia produced by the oral cavity and IE.<sup>3</sup> The rationale for the continued advocacy of antibiotic prophylaxis for specific cardiac conditions is based on the data from animal studies and on the premises that it is easier to prevent IE than treat it, certain cardiac conditions predispose to IE, and organisms known to cause IE are commonly found in the transient bacteria following some dental, gastrointestinal (GI), or genitourinary (GU) tract procedures.

## The AHA Guidelines for Antibiotic Prophylaxis Prior to Bacteremia-Producing Dental Procedures: Evolution into the 2007 Guidelines

Infective endocarditis is a serious and potentially life-threatening condition. The association between bacteremia arising from the oral cavity and IE became recognized in 1955. Since then, the AHA has promulgated a series of recommendations and guidelines for antibiotic prophylaxis for patients who are at risk of acquiring IE.

The AHA guidelines continued to evolve as new evidence came to light, and as new resistant strains of bacteria were encountered. During the consecutive revisions, one can observe a reduction in the at-risk groups that are recommended for prophylaxis, as well as a reduction in the duration and dosage of antibiotics that eligible patients are prescribed. Antibiotic type continued to be changed as resistant strains of bacteria became evident.

In the 1997 guidelines, cardiac patients were divided into three categories: high, moderate, and low risk for developing IE from bacteremia-producing dental procedures. Antibiotic prophylaxis was recommended for patients in the high- and moderate-risk categories.

Although these classifications provided a framework for the recommendations during dental treatment, the overuse of antibiotic prophylaxis by some resulted in an evolution in resistant strains of bacteria over the years, a fact that is continuously making IE more challenging to treat.<sup>3</sup> Also, the administration of antibiotics presents the possibility of allergic phenomena and anaphylaxis in susceptible individuals. Moreover, antibiotic prophylaxis cannot be guaranteed to prevent IE.<sup>3</sup>

The most current AHA guidelines now recognize two different categories of patients. The first is those who are at lifetime risk of developing IE from transient bacteremia, and the second is those who are at the most risk of developing adverse outcomes from IE once developed following transient bacteremia due to pre-existing cardiac conditions. The guidelines now recommend antibiotic prophylaxis prior to bacteremia-producing procedures in patients who are in the second category only.<sup>3</sup> Examples of conditions that put patients at risk of increased life-

### Table 1: Classification of Recommendations

#### Class I

Conditions for which there is evidence and/or general agreement that a given procedure or treatment is beneficial, useful, and effective.

#### Class II

Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure or treatment.

**Class IIa:** Weight of evidence/opinion in favor of usefulness/efficacy.

**Class IIb:** Usefulness/efficacy is less well established by evidence/opinion.

#### Class III

Conditions for which there is evidence and/or general agreement that a procedure/treatment is not useful/effective and in some cases may be harmful.

#### Level of Evidence

##### Level of Evidence A

Data derived from multiple randomized clinical trials or meta-analyses.

##### Level of Evidence B

Data derived from a single randomized trial or from nonrandomized studies.

##### Level of Evidence C

Only consensus of experts, case studies, or standard of care.

Source: American College of Cardiology and American Heart Association Task Force on Practice Guidelines

### Table 2: Cardiac Conditions Associated with the Highest Risk of Adverse Outcome from Infective Endocarditis for Which Prophylaxis with Dental Procedures Is Recommended

- Prosthetic heart valves, including bioprosthetic and homograft valves
- Previous infective endocarditis
- Cardiac transplantation recipients who develop cardiac valvulopathy
- Congenital heart disease (CHD)\*
  - Unrepaired cyanotic CHD, including palliative shunts and conduits
  - Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or catheter intervention, during the first six months after the procedure\*\*
  - Repaired CHD with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibit endothelialization)

Source: American Heart Association

\*Except for the conditions mentioned above, antibiotic prophylaxis is no longer recommended for any other form of CHD.

\*\*Prophylaxis is recommended because endothelialization of prosthetic material occurs within six months after the procedure.

time risk for developing IE are mitral valve prolapse (MVP) and rheumatic heart disease (RHD). Patients with the highest risk of developing adverse effects from infective endocarditis are outlined in Table 2. Antibiotic prophylaxis is advocated for patients affected with these conditions.

This change was brought about by a consensus committee that reviewed all of the pertinent literature and classified the recommendations and evidence according to the American College of Cardiology/American Heart Association classification of recommendations, using levels of evidence for practice guidelines (see Table 1).

The latest recommendations that reduced the indications for antibiotic prophylaxis were based on the fact that the evidence did not support the risk of continuing antibiotic coverage in cases of patient populations where IE prophylaxis may prevent only an exceedingly small number of cases of the disease.

Examples of conditions that put patients at a high risk for developing adverse outcomes from IE and where IE prophylaxis is indicated are listed in Table 2. It is important to note that the changes regarding antibiotic prophylaxis and cardiovascular conditions do not apply to recommendations for the protection of

**Table 3: Regimens for a Dental Procedure**

Situation	Agent	Regimen—Single dose 30–60 minutes before procedure	
		Adults	Children
Oral	Amoxicillin	2 g	50 mg/kg
Unable to take oral medications	Ampicillin or Cefazolin or Ceftriaxone	2 g IM or IV 1 g IM or IV	50 mg/kg IM or IV 50 mg/kg IM or IV
Allergic to penicillins or ampicillin oral	Cephalexin* or Clindamycin or Azithromycin or Clarithromycin	2 g 600 mg 500 mg	50 mg/kg 20 mg/kg 15 mg/kg
Allergic to penicillins or ampicillin and unable to take oral medication	Cefazolin or Ceftriaxone or Clindamycin	1 g IM or IV 600 mg IM or IV	50 mg/kg IM or IV 20 mg/kg IM or IV

Source: American Heart Association

\*Or other first- or second-generation oral cephalosporin in equivalent adult or pediatric dosage. Cephalosporins should not be used in an individual with a history of anaphylaxis, angioedema, or urticaria with penicillin or ampicillin.

Note that patients who are already receiving antibiotics systemically (those recommended above) are likely to have developed resistant organisms. A different class of antibiotic should be used for the prophylaxis or the procedure should be delayed at least 10 days if possible.

**Table 4: Primary Reasons for Revision of the Infective Endocarditis Prophylaxis Guidelines**

- Infective endocarditis (IE) is more likely to result from frequent exposure to random bacteremias associated with daily activities than from bacteremia caused by a dental procedure.
- Prophylaxis may prevent an exceedingly small number of cases of IE, if any, in individuals who undergo a dental procedure.
- The risk of antibiotic-associated adverse events exceeds the benefit, if any, from prophylactic antibiotic therapy.
- Maintenance of optimal oral health and hygiene may reduce the incidence of bacteremia from daily activities and is more important than prophylactic antibiotics for a dental procedure to reduce the risk of IE.

Source: American Heart Association

patients at risk for hematogenous joint infections. The specific antibiotic regimen for prophylaxis is detailed in Table 3.

### Legal Questions Raised by the Change in Antibiotic Prophylaxis Guidelines

A large number of patients who were classified as a high or moderate risk for developing infective endocarditis in previous AHA guidelines and thus required antibiotic prophylaxis prior to bacteremia-producing dental procedures will no longer require this coverage. Dentists should be aware that it often takes time for other health care providers—primary care providers, cardiologists, and surgeons—to understand the clinical ramifications of these changes and that they may still request that their patients receive antibiotic prophylaxis for all dental procedures. This presents both a medical and a legal quandary for the treating dentist.

The American Dental Association Division of Legal Affairs has prepared a statement that attempts to assist dentists in understanding their roles in the treatment of patients who no longer need antibiotic prophylaxis, but whose medical caregivers still advocate coverage. In summary, the decision of whether or not to prescribe antibiotic prophylaxis is a clinical decision that is made taking into consideration the guidelines, the risk versus benefits of the therapy, and the dentist's professional and clinical judgment of each specific case. Disagreements between dentists and other health professionals over whether or not to prescribe antibiotic prophylaxis should be carefully documented after a reasoned discussion.<sup>6</sup> Although patients maintain the right to consent to treatment, the final decision of the need for these antibiotics rests in the hands of the treating dentist.

### Conclusion

The new AHA guidelines recommend antibiotic prophylaxis prior to bacteremia-producing dental procedures only for patients with the highest risk for developing adverse outcomes of infective endocarditis. These are limited to four groups of patients: patients with prosthetic valves; patients with history of infective endocarditis; patients who are heart transplant recipients who develop cardiac valvulopathies; and patients with congenital heart defects. The ambiguities of risk groups no longer exist in these guidelines. The current recommendations hope to eliminate the overuse of prophylactic antibiotics. This will help in reducing the evolution of the ever-increasing number of resistant strains of bacteria and the incidence of adverse reactions to antibiotics. It should be stressed, though, that bacteremia in any form should be reduced in all patients with underlying cardiac conditions. Periodontal disease and caries should be eliminated and oral hygiene improved. This will reduce the frequency of bacteremia significantly, especially that related to daily activities such as mastication and tooth-brushing. ■

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# A Clinico-Pathologic Correlation

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**Figure 1a.** Clinical photograph of expansion in the right mandible. Second and third molars have failed to erupt.

## History

**A** 12-year-old Caucasian boy was referred to the oral and maxillofacial surgery department at Tufts–New England Medical Center by his orthodontist for evaluation of bilateral multilocular radiolucencies in the mandible. These were noted on a routine panoramic radiograph that was taken prior to the initiation of orthodontic treatment. The patient and his parents were not aware of any expansion of the mandible, and there was no history of pain, paresthesia, or teeth mobility reported. The family history was not contributory and no siblings were reported to have similar conditions.



**Figure 1b.** Clinical photograph of 12-year-old boy. Note bilateral fullness in the cheeks.

On clinical examination, fullness in both cheeks was noted. The eyes appeared normal with no scleral showing above-normal limits. The nose was normal with no obstruction. Bony, nontender expansion of the posterior mandible was noted bilaterally (see Figure 1a). There was no bony expansion in the maxilla. The mandibular second and third molars had not yet erupted, but otherwise, all dental findings were normal. There was no spacing, missing teeth, or malpositioned teeth noted. The patient had a palpable, nontender, mobile, submandibular lymph node. He reported having that lymph node for more than two months with no change in size.

The panoramic radiograph revealed bilateral mandibular multilocular radiolucencies expanding in a soap bubble–like fashion. The radiolucencies involved the mandibular ramus and angle, and extended superiorly to the sigmoid notch. The mandibular third molars were involved in the lesions (see Figure 2). A computed tomography (CT) scan confirmed bilateral multilocular radiolucencies involving teeth #17 and #32. There was no evidence of involvement of the bones of the maxilla, nose, vomer, or zygoma. The lesions were uniformly radiolucent, with a few scattered bony septa (see Figure 3).

All laboratory findings were normal, including serum calcium, phosphorus, and parathormone serum levels. To confirm a diagnosis, the patient was taken to the operating room where he underwent biopsies of the radiolucent lesions along with removal of the third molars under general anesthesia. He tolerated the procedure well and had an uneventful postoperative course.

## Differential Diagnosis

- Cherubism
- Multiple odontogenic keratocysts
- Hyperparathyroidism
- Bilateral giant cell granuloma
- Histiocytosis
- Infantile cortical hyperostosis

## Histopathologic Findings

Microscopic tissue sections of the received specimens showed fragments of vascular fibrous connective tissue composed of a cellular fibroblastic stroma interspersed with focal aggregations of small, multinucleated giant cells. In addition, areas of dense fibrous connective tissue with scattered odontogenic rests were noted, as well as mild chronic inflammatory cellular infiltrate and extravasated blood cells. An occasional eosinophilic cuffing of small vascular channels was also noted, as well as a few spicules of vital bone.



**Figure 2. Panoramic radiograph. Multilocular radiolucencies can be noted bilaterally, with involvement of #17 and #32. Panoramic radiograph was taken prior to orthodontic treatment, and the lesions were found incidentally.**

## Diagnosis

Cherubism

## Discussion

Cherubism is a rare developmental disease that is inherited as an autosomal dominant trait. It has been described in the literature as early as 1933.<sup>1</sup> The disease was previously referred to as familial fibrous dysplasia of the jaw, a term that is no longer considered accurate, especially after better understanding of the disease.<sup>2</sup> This condition represents a variant of giant cell lesions that is given the diagnosis after a correlation between the histopathologic and clinical pictures.

Cherubism commonly affects patients in the age group of 2–5 years. It has been reported in patients as young as 1 year old<sup>2,3</sup> and is usually self-limiting; it starts in early childhood and involutes by puberty.<sup>2,4</sup> The affected individual shows expansion of the affected bones. Cherubism is known to affect the bones of the mandible and maxilla. Involvement of the ribs and humerus bones is rare but has been reported.<sup>2,4</sup> Clinically, patients affected with cherubism demonstrate a spectrum of clinical appearances.

The name “cherubism” was derived from the cherub-facies appearance of patients with the most severe clinical manifestation. In this group of patients, the mandibular ramus, angle, and body are affected by the expansion. The maxilla is affected here as well, leading to expansion of the orbital floor and inferior orbital rim. This results in the tilting of the globe upwards, as well as stretching of the skin of the lower eyelid resulting in a



**Figure 3. CT scan—axial and coronal cuts. The scans confirmed the clinical and panoramic radiograph findings. Multilocular lucencies were noted. The CT scan did not reveal any involvement of the maxilla, vomer, or nasal bones.**

wider scleral show inferior to the iris. The combination of these features leads to fullness of the cheeks and an appearance of “eyes upturned to heaven,” giving the classical angelic appearance. Teeth are often involved in cherubism, and spacing, impactions, failure of eruption, and mobility may be part of the clinical presentation. Milder variations present a varying degree of cheek fullness, ocular involvement, and maxillary and mandibular expansion.<sup>2-4</sup>

Our patient presented with the asymptomatic lesions at age 12. Although this is not the typical age for presentation of cherubism, there have been similar reports in the literature. This is usually the result of milder involvement of the jawbones, leading to very slow expansion often missed by the patient and the parents. The patient also presented with submandibular lymphadenopathy, which is common in patients with cherubism.<sup>2,3</sup>

Given the inheritance mode of cherubism, it can be considered a familial disease. Isolated cases have been reported in the literature—ours is one of them. These cases are due to isolated gene mutations.<sup>2,3</sup>

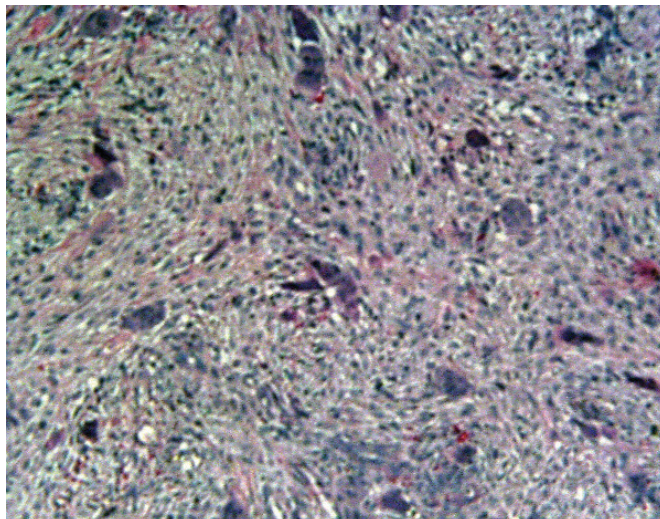
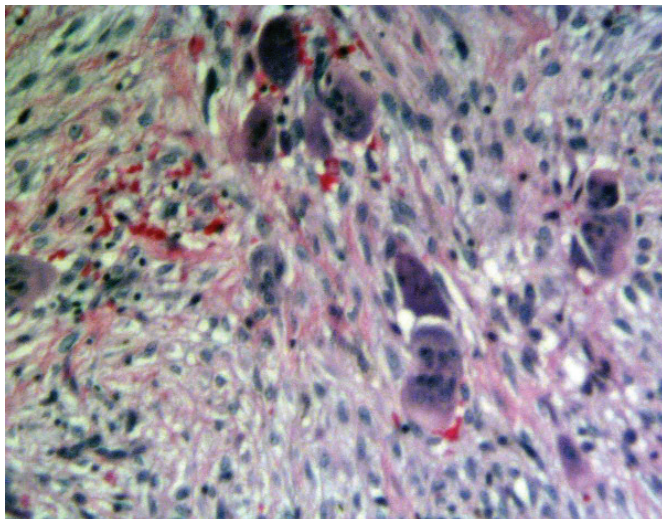
The histopathologic picture of cherubism lesions is that of vascular fibrous tissue hyperplasia and multinucleated giant cells. An eosinophilic deposit around blood vessels is indicative of cherubism, though this is not found in all cases. Histologically, there is no distinction between cherubism and giant cell tumors of the jaw, except for the occasional perivascular eosinophilic deposit that is characteristic for cherubism. The diagnosis is made according to the clinical presentation.<sup>2-4</sup>

Laboratory testing in cherubism reveals normal values of calcium and phosphorus, ruling out hyperparathyroidism (primary or secondary) from the list of differential diagnosis. In our patient, all laboratory values were normal.<sup>2,3</sup>

The list of differential diagnoses includes three conditions that are similar histopathologically, but differ in clinical presentation: bilateral giant cell granulomas, cherubism, and hyperparathyroidism. Although reported in literature, giant cell granulomas rarely occur on more than one location. Hyperparathyroidism—primary or secondary—results in increased levels of parathyroid hormone (PTH), resulting in increased osteoclastic activity in the bone, as well as the production of multiple multinucleated giant cells, leading to the formation of brown tumor. Hyperparathyroidism clinically resembles cherubism and other giant cell lesions, so the levels of serum calcium, phosphate, and PTH need to be evaluated prior to forming a definitive diagnosis.

Also on the list of differential diagnoses is the condition termed histiocytosis, or Langerhans cell histiocytosis. This condition resembles cherubism and other giant cell lesions clinically and radiographically, but represents an entirely separate entity. It is considered a neoplasm of a component of the immune system, the Langerhans cells.<sup>3</sup> It produces radiolucent lesions in the jaws, as well as other bones, and might also involve viscera. Histologically, histiocytosis is composed of inflammatory cells and Langerhans cells, as well as neutrophils and lymphocytes.

Gorlin-Goltz syndrome, or multiple basal cell nevi syndrome, can present with multiple odontogenic keratocysts (OKC) of the jaw as one of the symptoms. The cysts produce a multilocular radiolucent appearance, with defined borders.



**Figure 4. High- and low-power microscopic sections taken from the biopsy. Both sections show multiple multinucleated giant cells in a fibrous connective tissue stroma.**

Biopsy specimen, aspiration biopsy, and clinical presentation, along with lab tests, will allow for ruling out this entity prior to diagnosis of cherubism.

Infantile cortical hyperostosis, also known as Caffey's disease, is a self-limiting disorder with unclear etiology. Patients present with inflammation of the periosteum, and deposition of subperiosteal bone takes place, resulting in enlargement of the mandible. This condition can also affect long bones. It resolves within 6–11 months after initiation.<sup>8</sup>

No consensus to the best form of treatment for cherubism has been established. It has been reported that surgical intervention for the removal of the lesions and for curettage has led to recurrence that resulted in a more aggressive expansion in cases. Radiotherapy was reported to cause malignancy in cases of cherubism, and therefore it is contraindicated.<sup>2</sup> Biopsy of the lesion and removal of teeth in the line of the lesion are the treatment options that most cherubism-affected individuals receive. Our patient received this form of treatment. In certain cases, though, the expansion of the jaw is such that it causes psychological issues for the young individuals afflicted. In this case, the patient and the family should be well aware of the possible effects of the remodeling procedure. Calcitonin has been suggested in the literature for treatment of cherubism as well as other forms of giant cell granulomas.<sup>6,7</sup>

Our patient has been seen for follow-up and at this time no further treatment is necessary. The parents and the patient are aware of the fact that the second molars may also fail to erupt. The patient is set up for a follow-up plan in which he will be clinically evaluated and examined with the use of panoramic radiographs. ■

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## CINNAMON STOMATITIS

**M**UCOSITIS AND PERIORAL DERMATITIS associated with exposure to cinnamon compounds such as cinnamaldehyde and cinnamic alcohol, oil of cinnamon, and cinnamic acid have been reported with some frequency in the literature. Although the pathogenesis is not completely understood, both immunologic and nonimmunologic mechanisms are thought to contribute to such responses.<sup>1,2</sup> These compounds are found in popular toothpastes, mouthrinses, lip balms, chewing gum, and candies.

Clinically, patients experiencing mucositis secondary to cinnamon-flavoring agents may complain of a burning sensation or describe sloughing of the oral mucosa.<sup>3</sup> Intraoral lesions typically present with an erythematous background often associated with leukoplakic regions or areas of ulceration that may mimic lichen planus or lupus erythematosus. In some patients, the lesions are focal and resemble a fixed drug reaction at the site of direct exposure to the cinnamon-containing product,<sup>4</sup> whereas in other patients a more generalized mucosal erythema is seen in association with a burning sensation mimicking erythematous candidiasis.



**Figure 1. Cinnamon stomatitis presenting as a symptomatic shaggy leukoplakic lesion of the buccal mucosa on an erythematous background.**



**Figure 2. Symptomatic leukoplakic lesion of the lateral tongue bearing a superficial resemblance to oral viral leukoplakia that resolved after discontinuance of cinnamon gum chewing.**

Given the variable clinical appearance, the diagnosis of cinnamon stomatitis typically requires a thorough history in which the patient is specifically questioned about the use of such products. Most patients experience resolution of the lesions following withdrawal of the offending agent. If erythematous candidiasis is suspected, resolution should be seen following treatment with nystatin. Biopsy with submission of lesional tissue for histopathologic examination is indicated if a cause-and-effect relationship between the mucosal changes and cinnamon use cannot be established, as dysplasia, squamous cell carcinoma, lichen planus, and lupus erythematosus may share similar clinical features. ■

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# What Every Dentist Should Know About the “Z-Sedatives”

WM. STUART MCKENZIE  
MORTON ROSENBERG, DMD

Mr. McKenzie is a dental student at Tufts University School of Dental Medicine, and Dr. Rosenberg is professor of oral and maxillofacial surgery and head of the division of anesthesia and pain control at Tufts University School of Dental Medicine.

According to the National Institutes of Health, approximately 30 percent of all Americans complain of sleep disruption, while 10 percent display symptoms congruent with chronic insomnia.<sup>1</sup> One of the most common treatments for insomnia is prescription sleep medications that help people fall asleep and remain asleep. Historically, barbiturates were initially popular for treating insomnia, but their long “hangover” effect made them easily replaced by the introduction of the benzodiazepines. Triazolam (Halcion<sup>®</sup>), diazepam (Valium<sup>®</sup>), and oxazepam (Serax<sup>®</sup>) rapidly became the treatment of choice for insomnia. Recently, a new class of nonbenzodiazepines—the “z-sedatives”—has overtaken the older benzodiazepines as the most commonly prescribed sleep medications. The three most popular z-drugs are zolpidem (Ambien<sup>®</sup>), zaleplon (Sonata<sup>®</sup>), and eszopiclone (Lunesta<sup>®</sup>). The Food and Drug Administration (FDA) also recently approved the production of zolpidem tartrate, a generic form of Ambien. Many dentists prescribe these medications for patients who have difficulty sleeping the night prior to an appointment or as a procedural sedative. With 43 million prescriptions for sleep medications filled in 2005, generating \$2.7 billion for pharmaceutical companies, it is important that dentists be aware of these drugs’ mechanism of action and potential drug interactions.<sup>2</sup>

## Mechanism

The z-sedatives, while distinct pharmacological entities, have similar binding sites as the traditional benzodiazepine hypnotics and are also referred to as “nonbenzodiazepine-benzodiazepines.” They both bind to gamma-aminobutyric acid (GABA) regions of the benzodiazepine receptors (BZ receptors) located throughout the central nervous system. When a z-drug or benzodiazepine drug binds with a BZ receptor, it causes GABA (inhibitory molecule) to bind with higher affinity, causing chloride channels to open. Additionally, the chloride channels remain open longer and hyperpolarize the neurons, depressing the central nervous system.<sup>3,4</sup>

The difference between benzodiazepines and nonbenzodiazepines is in the binding specificity they exhibit within the nervous system. Benzodiazepines show little specificity in BZ

receptor binding, and thus all of the clinical manifestations of a benzodiazepine agonist. Sedation, muscle relaxation, decreased cognitive function, amnesia, anticonvulsive, and anxiolytic properties are seen.<sup>5</sup> The z-sedatives, on the other hand, have a much higher affinity for the BZ receptors in areas of the nervous system associated with arousal and maintenance of consciousness.<sup>6</sup> The z-drugs have very little effect on memory or cognitive function. And with the rapid onset and short duration of action greatly reducing residual sedative effects such as grogginess or poor motor/cognitive function, it is easy to understand their usefulness as sleep medications. The z-sedatives have also been shown to demonstrate less tolerance than benzodiazepines.<sup>7</sup> All of the z-sedatives are classified as schedule IV controlled substances due to possible dependence and abuse.

## Zolpidem (Ambien)

Zolpidem is administered in 5 mg or 10 mg tablets that are rapidly absorbed in the gastrointestinal tract. Peak plasma concentration occurs in 1.6 hours, and the drug has a half-life of 2.5 hours. Zolpidem is metabolized via the CYP3A4 hepatic enzyme, produces no active metabolites, and is excreted by the kidneys. The most frequent adverse effects reported during clinical trials were dizziness (5 percent), drugged feeling (3 percent), and diarrhea (1 percent).<sup>8</sup>

There are several important drug interactions that should be considered when treating patients using zolpidem. Alcohol has a synergistic sedative effect in conjunction with zolpidem. CYP3A4 inhibitors such as erythromycin, itraconazole, and ketoconazole elevated the plasma concentration of zolpidem. Conversely, inducers of the CYP3A4 enzyme such as rifampin, phenytoin, carbamazepine, and phenobarbital significantly decreased the plasma concentrations of zolpidem.

Ambien takes effect in less than 30 minutes, and it lasts for 6 to 8 hours.<sup>9</sup> Ambien CR<sup>®</sup> is the extended-release form of zolpidem, which displays increased duration of action.

## Zaleplon (Sonata)

Zaleplon is available in 5 mg, 10 mg, and 20 mg doses that are rapidly absorbed; however, it undergoes extensive presystemic metabolism resulting in 30 percent bioavailability.<sup>10</sup> Peak plasma concentrations occur 1 hour after dosing, and zaleplon exhibits a half-life of 1 hour. Zaleplon is metabolized mainly via the enzyme aldehyde oxidase, and to a lesser extent by the CYP3A4 cytochrome enzyme. Both routes produce inactive metabolites

Table 1: Pharmacologic Profiles of the Z-Sedatives

	Drug Onset	Time to Peak Plasma Level	Half-life	Clinical Duration of Action	Metabolism
Zaleplon (Sonata <sup>®</sup> )	Less than 60 minutes	1.0 hour	1.0 hour	4–5 hours	Aldehyde oxidase and CYP3A4
Zolpidem (Ambien <sup>®</sup> )	Less than 30 minutes	1.6 hours	2.5 hours	6–8 hours	CYP3A4
Eszopiclone (Lunesta <sup>®</sup> )	Less than 30 minutes	1.0 hour	6.0 hours	6 hours	CYP3A4 and CYP2E1

Table 2: Drug Interactions

	Synergistic CNS Depressors	Elevators of Z-Drug Blood Plasma Concentration	Reducers of Z-Drug Blood Plasma Concentration
Zaleplon (Sonata <sup>®</sup> )	Alcohol	Erythromycin, ketoconazole, and especially cimetidine	Phenytoin, carbamazepine, and phenobarbital
Zolpidem (Ambien <sup>®</sup> )	Alcohol	Erythromycin, itraconazole, and ketoconazole	Rifampin, phenytoin, carbamazepine, and phenobarbital
Eszopiclone (Lunesta <sup>®</sup> )	Alcohol	Ketoconazole, itraconazole, clarithromycin, nefazodone, ritonavir, and nelfinavir	Rifampin, phenytoin, carbamazepine, and phenobarbital

that are excreted by the kidneys. Adverse effects were similar to those for zolpidem.

The rapid metabolism and low bioavailability of zaleplon make it a short-acting sedative with virtually no residual effects at 4–5 hours after being given.<sup>11</sup> Zaleplon is therefore better suited for falling asleep quickly as opposed to staying asleep.

Although the CYP3A4 pathway is a minor route of elimination, inhibitors of the pathway such as erythromycin and ketoconazole will also result in elevated plasma concentrations of zaleplon. Similarly, inducers of CYP3A4 (phenytoin, carbamazepine, and phenobarbital) will decrease plasma concentrations. Cimetidine (Tagamet<sup>®</sup>) inhibits both the CYP3A4 pathway and the aldehyde oxidase pathway, resulting in an increase in plasma concentration.<sup>12</sup>

Because all of the z-sedatives also have many of the clinical sedative and anxiolytic effects seen with true benzodiazepines, the use of zaleplon as a procedural oral sedative for dental-phobic patients has been studied. In these studies, it has been compared favorably with triazolam (Halcion) and has demonstrated faster recovery.<sup>13</sup>

## Eszopiclone (Lunesta)

Eszopiclone is available in 1 mg, 2 mg, or 3 mg tablets. Peak plasma levels occur 1 hour after administration, and eszopiclone has a half-life of 6 hours. Eszopiclone is metabolized predominantly via demethylation and oxidation by the CYP3A4 and CYP2E1, with one of the metabolites exhibiting some GABA binding affinity.<sup>14</sup> The metabolites are then excreted in the urine.

Similar to the previously mentioned z-drugs, alcohol produces increased central nervous system depression when used in conjunction with eszopiclone. Also, inhibitors of hepatic CYP3A4 enzyme (ketoconazole, itraconazole, clarithromycin, nefazodone, ritonavir, and nelfinavir) would be expected to increase plasma levels of eszopiclone. Conversely, inducers of CYP3A4 (rifampin, phenytoin, carbamazepine, and phenobarbital) decrease the plasma levels.<sup>15</sup> Note, too, that patients with severe hepatic impairment should not receive more than 2 mg of eszopiclone due to increased plasma levels.

Significant adverse effects of eszopiclone include unpleasant taste, headache, respiratory tract infection, dizzi-

ness, and dry mouth. Interestingly, eszopiclone is the first sedative to be approved without the restriction “for short-term use only.” Eszopiclone has an onset time of approximately 30 minutes, and no residual sedative or psychomotor effects at 6 hours after administration.<sup>16</sup>

## Conclusion

The z-sedatives represent an advance in the treatment of insomnia that eliminates or reduces many of the adverse side effects of the benzodiazepines. Their pharmacokinetic properties of rapid onset and relatively short duration and pharmacodynamic qualities of little grogginess or psychomotor deficiencies detected after 6–8 hours make their increasing popularity understandable. The z-sedatives may also have a role in reducing anxiety and providing sedation in the dental environment. It should be noted, however, that the FDA has recently issued a warning about a side effect of “sleep driving” and “sleep eating” after taking these sleep medications. These reports relating to people having no memory of events after taking prescription benzodiazepines or z-sedatives only reinforce that no matter how safe a central nervous system depressant may appear, one must always be aware of side effects and idiosyncrasies. ■

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## CLINICAL CASE STUDY

**NICHOLAS DELLO RUSSO, DMD, MSCD**

*Dr. Dello Russo is attending periodontist at Massachusetts General Hospital in Boston.*

# SALVAGING A FAILING IMPLANT

**O**SSEOINTEGRATED DENTAL IMPLANTS ARE BECOMING THE STANDARD of care for replacing missing teeth. As more dentists begin placing implants, complications will inevitably arise, and it is important to be able to manage these situations. The following case report illustrates a common implant complication and how it was handled.

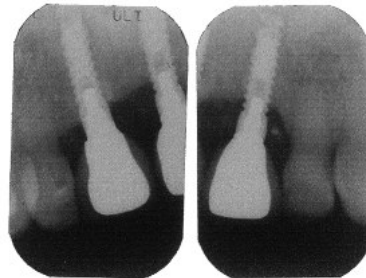
The patient, a healthy middle-aged male, had two implants placed by another clinician in the #8 and #9 sites. Both implants became acutely infected within weeks of being placed. When the patient presented to my office, there were 9 mm pockets and significant bone loss around both implants, especially #9 (see Figure 1). A salvage procedure was performed, which included flap entry and careful degranulation of the area. The several rows of exposed threads were etched with a tetracycline slurry and grafted with deproteinized bovine bone xenograft. A membrane was not used.

Six years later, the patient returned to my office and a follow-up X-ray was taken. Excellent bone healing and regeneration were evident (see Figure 2). Some soft-tissue shrinkage did occur but probing depths were minimal.

Placing implants is not “easy” and requires careful attention to proper surgical protocol. Any dentist who plans on placing implants should be very comfortable with performing oral surgery and be ready to manage possible complications. ■



**Figure 1.**  
Initial X-ray shows an infected implant area with significant bone loss around teeth #8 and #9.



**Figure 2.**  
A six-year follow-up X-ray shows excellent bone healing and regeneration.

### About Clinical Case Study

A Clinical Case Study is defined as a written and visual assessment of a clinical case wherein the author presents before-and-after radiographs and/or photographs as a means to discuss the diagnosis, treatment plan, and actual treatment of a particular situation. The purpose of this study is to encourage JOURNAL readers to contribute a clinical response to the cases presented. It is our hope that many practitioners will contribute their ideas and treatment approaches, with the end result being a means for communication and learning.

Please address your correspondence to Clinical Case Study, JOURNAL OF THE MASSACHUSETTS DENTAL SOCIETY, Two Willow Street, Suite 200, Southborough, MA 01745. Responses may be published in a future issue of the JOURNAL.



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# BOOK REVIEWS



**NORMAN BECKER, DDS, EDITOR EMERITUS**

## Tooth Whitening: Indications and Outcomes of Nightguard Vital Bleaching

**VAN B. HAYWOOD**

*Quintessence Publishing*



The intention of this text is to provide clinicians and patients with valuable information about the benefits and safety of using nightguard vital bleaching.

To provide the necessary tips, Dr. Haywood includes topics such as proper examinations; diagnosis of discolorations; treatment of naturally yellow teeth, partial brown and white discolorations, and nicotine and tetracycline stains; treatments for single discolored teeth; and treatment of sensitivity. The book also covers the design and fabrication of custom trays. One section of special interest is devoted to how to discuss bleaching with patients. The author uses multiple photographs to illustrate this well-written text.

## Contemporary Orthodontics, Fourth Edition

**WILLIAM R. PROFFIT, HENRY W. FIELDS JR., AND DAVID M. SARVER**

*Mosby Elsevier*

As in previous editions, the objective of *Contemporary Orthodontics* is to provide a comprehensive overview of this subject that is altogether accessible for students, useful for residents, and valuable for practitioners. The authors provide basic background information that every dentist needs, followed by more detailed information for orthodontic residents and specialists.

The text includes the importance of orthodontics as a treatment modality in all phases of medicine, an increased emphasis on soft-tissue consideration, and clinical examination in diagnosis and treatment planning based on clinical decisions regarding data.

Additionally, the book features discussions dealing with implant anchorage and ontogenesis. The updated entry on computer applications to appliance designs and treatment is a great addition, so that all clinicians can understand the advantages—as well as the limitations.

This text is also available in an “E-dition,” providing access to a user-friendly Web site where answers to clinical questions can be easily searched. This Web site is updated frequently to provide evaluation and commentary on current orthodontic literature.

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## QuintEssentials 3: Indirect Restorations

**DAVID BARTLETT AND DAVID RICKETTS**

*Quintessence Publishing*



This book, in keeping with the rest of the QuintEssentials series, is not intended to be a comprehensive work but rather to give the clinician insight and pointers to enhance the success of patient care. Thus it is an easy-to-read book promoting evidence-based approaches to indirect restorations.

The authors use failed restorations as the starting point for understanding success. Through the use of many illustrations and tips, the text serves as a guide to help plan treatment, taking into consideration previous caries conditions, indications for full or partial coverage, reliable and retentive cores, as well as types of crowns and materials to be used. The text also offers guidelines for handling tooth preparations, taking shades, making provisionals, keeping interocclusal records, and managing difficulties with short clinical crowns.

Once read, this book should be on hand for ready reference and guidance. The many hints throughout the text are of value to the clinician.

## QuintEssentials 5: Special Care Dentistry

**JANICE FISKE, CHRIS DICKINSON, CAROLE BOYLE, SOBIA RAFIQUE, AND MARY BURKE**

*Quintessence Publishing*



*Special Care Dentistry* should be required reading for all students and practitioners. Even if one does not treat special needs patients, this book will extend and enhance practitioners' understanding and appreciation of the specifics of providing care to this segment of the population.

To appreciate the scope and value of this book, one need look no further than the titles of the chapters: Understanding Special Care Dentistry; Managing the Oral Health of Patients with Physical Disabilities; Managing the Patient with a Sensory Disability; Managing the Patient with a Learning Disability; Managing the Patient with Mental Illness; Managing Patients Who Require Antibiotic Coverage; Managing Immunocompromised Patients; Managing the Patient Having Radiotherapy; Management of Patients with Bleeding Disorders; Managing Pronounced Gag Reflexes; Patient Management Through Non-Invasive Treatments; and Sedation and General Anesthesia in Special Care Dentistry

After reading this list, one realizes that some practitioners, if not all, have been involved with special care dentistry with some of our patients and that special care dentistry—when defining this phrase in the broadest terms—is providing and enabling the delivery of oral care for people with any impairment or disability. ■



## DENTAL EDUCATION

**MELISSA CARMAN, MANAGING EDITOR**

Highlighting key events taking place in dental education in Massachusetts.



### Boston University

**S**PENCER FRANKL, DDS, ANNOUNCED IN JULY that he will step down as dean of the Boston University School of Dental Medicine (BUSDM) on July 1, 2008, or as soon as a successor is named. The longest-serving dean of any dental school in the United States—as well as longest-serving dean in the history of Boston University—Dr. Frankl has been associated with BUSDM since 1964 and dean since 1977.

In 1964, Henry M. Goldman, BUSDM founding dean, recruited Dr. Frankl to create the department of pediatric dentistry. Dr. Frankl served as chairman of the department from 1964 to 1976, as well as serving as chief of pediatric dentistry at University Hospital, head of pediatric dentistry at Beth Israel Hospital, and chief of dental service at the Joseph P. Kennedy Jr. Memorial Hospital for Infants and Children.

During Dr. Frankl's three decades as dean of BUSDM, the dental school evolved from a school solely for graduate dental education to a school that offers both the undergraduate DMD degree and a full complement of graduate and research programs. He has overseen curricula revisions of diagnostic, medical, behavioral, and restorative sciences, as well as an exponential growth in research funding.

"[Dr. Frankl] has been a visionary leader, and BUSDM will continue to reap the benefits of his contributions for many years to come," says Boston University President Robert Brown.

A search committee has been formed and charged with conducting a nationwide search for Dean Frankl's successor.



**T**HE AMERICAN ACADEMY OF PERIODontology Foundation has named Melanie Campese, DMD, first-year resident in the combined MSD/CAGS program in periodontology and oral biology at BUSDM, as the 2007 recipient of its Education Fellowship. The award encourages residents to expand their research interests and participation in academics.

Since joining BUSDM in summer 2006, Dr. Campese has worked in the Oppenheim Laboratory, where researchers look at salivary proteins with properties to prevent periodontal disease. Dr. Campese studies salivary proteins known as histatins in healthy people under the supervision of Eva Helmerhorst, PhD, assistant professor in the department of periodontology and oral biology.

"Because these proteins have such beneficial effects for killing the periodontal pathogens, it was decided to direct research comparing the levels and stability of histatins between healthy people and people who have periodontal disease," explains Campese, "and to see if there is a way we can give these proteins to people with periodontal disease as a treatment." ■

her proposed study, "Histatins in the Prevention of Periodontal Disease," Campese will work with more subjects and collect not only saliva but also other fluids in the mouth.

"Her work represents a modern approach to find host-derived molecules useful for the treatment or prevention of periodontal disease," says Frank Oppenheim, DMD, department chair. The American Academy of Periodontology (AAP) honored Campese at the organization's annual meeting in October.

### Tufts University

**O**N JUNE 22 AND 23, THE TUFTS UNIVERSITY SCHOOL OF Dental Medicine (TUSDM) hosted the Collaboration for Oral Health-Related Informatics (COHRI), the first dental school consortium for informatics. The consortium's goal is to develop standardized electronic health records to facilitate data sharing for research purposes. All of the schools that sent representatives to the meeting—University of California at San Francisco, Creighton, Detroit-Mercy, Harvard, Indiana, Maryland, Oregon Health & Science University, SUNY at Stony Brook, University of Texas at Houston, and Tufts—use the AxiUm electronic health record system developed by Axio Corp. of Vancouver, British Columbia. Approximately 35 dental schools in North America and one in Europe use this system, and that number is expected to increase to 45 by the end of 2008. Because of the ease of developing common data within the AxiUm system, it is expected that membership in COHRI will reach 30 schools by this time next year.

The consortium keynote speaker was Dr. Isabel Garcia, deputy director of the National Institute of Dental and Craniofacial Research. Dr. Garcia discussed the need for greater and more specific clinical research data in dentistry, and strongly encouraged the members of COHRI to continue to work toward the goal of creating and sharing common data.

The short-term goal of the consortium is to develop common record entries for medical and dental histories, diagnosis, treatment plans, daily records of dental, treatment outcomes, and administrative services. As the first step in this process, members agreed upon a modification of the ADA Health History Form for shared data collection. Within the year, the consortium plans to agree upon diagnostic codes, case note coding, treatment plan and treatment outcome codes, and a common patient-informed consent form for research. The second meeting of the consortium will be held in Vancouver in late February 2008.

The consortium and its program were conceived and led by three TUSDM faculty: Dr. Robert Chapman, professor and chair of prosthodontics and operative dentistry and director of informatics; Dr. David Russell, associate dean for clinics and associate director of informatics; and Dr. Paul Stark, head of biostatistics and associate director of informatics.

### Forsyth Institute

**T**HE FORSYTH INSTITUTE, LOCATED IN BOSTON'S FENWAY NEIGHBORHOOD, has signed a definitive purchase and sale agreement with Boston's Museum of Fine Arts (MFA) and will be relocating to a new facility. The MFA is acquiring the Forsyth Institute property, which is located at 140 The Fenway.



Built in 1914, the historic Forsyth building comprises approximately 107,000 square feet of existing space on 1.6 acres of land. The MFA plans to expand the museum's American Wing, which overlooks Forsyth Way, as part of an extensive renovation project.

"It is fitting that this Boston landmark will be sold to another organization with long-standing ties to the Fenway," says Dominick DePaola, DDS, PhD, president and CEO of Forsyth. "The Museum of Fine Arts shares Forsyth's historic commitment to the city of Boston, and we are happy that this building will continue to serve as a resource for the community."

According to Dr. DePaola, Forsyth's move will help the Institute gain access to contemporary state-of-the-art technology and possibly co-locate with others in the scientific community.

The closing for the purchase was finalized on September 27. As part of the arrangement, Forsyth was to become a tenant and would remain in the building until arrangements for the new facility, which has not been disclosed, are completed. ■

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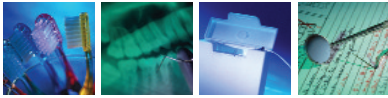
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## ART OF DENTISTRY

### ERIC K. CURTIS, DDS, ELS

Dr. Curtis is past president of the American Association of Dental Editors. In 2006, he received the American Dental Association's Distinguished Editor Award.

## AND NOW A WORD FROM OUR SPONSOR

LAST YEAR, I SPONSORED MY DAUGHTER JILLIAN'S SOCCER TEAM. That mostly meant that my wife washed out the kids' sports bottles and iced them down before every game, like a real-life version of Adam Sandler in the movie *The Waterboy*. But the coach grinned as he pumped my hand and announced that my cash layout also bought me naming rights.

"What do you want to call the team?" he asked.

My only point of comparison for this unexpected opportunity was the vague memory that Chelsea Clinton had once played on a dentist-sponsored soccer team in Washington called the Molar Rollers. I couldn't think of any name less cheesy.

"I don't care," I said. "You guys decide."

Bad idea. The coach surveyed the team. What's the scariest thing at the dentist? he wanted to know. The resounding response: The shot. The coach said, "OK, then, we're Novocain."

Everyone knows about Novocain, although the stuff probably hasn't been used by a dentist in the United States for more than 30 years. It's a brand pressed so deeply into our consciousness that its name has morphed into generic use, akin to saying "Coke" to mean any cola, or even any soft drink, or calling any tissue a "Kleenex." People invoke Novocain to suggest a state of insensitivity, obliviousness, or uselessness. In his memoir *Experience*, Martin Amis wrote: "My lower lip, flaccid with anesthetic, hung over my chin like the tongue of a dog." And thus Team Novocain aims to leave their foes feeling fuzzy.

The coach had a big vinyl banner produced, emblazoned with an illustration of a crazed dentist bearing down on a soccer ball with an enormous syringe. "That looks mean enough," he said with satisfaction. "Go, Novocain!" If this was supposed to reflect well on my office, I thought, let alone the profession, I had made a big mistake.

Yet no one flinched. "Go, Novocain!" yelled the players, to cheer each other on. "Go, Novocain!" screamed the soccer mothers.

I looked around, warily, to see what other cultural references hinged on this celebrated trade name. Nobel Prize winner Gunter Grass's book *Local Anaesthetic* is an entire novel wrapped around the drug. To Grass, Novocain is a metaphor for civilization itself, soothing and smoothing out life's rough edges. (Yet it wears off: "Nothing lasts," he writes on the last page. "There will always be pain.") To Martin Amis, local anesthetic is a symbol of efficiency. His dental surgery is reduced to

"three jabs, two stitches, and a sanguinary interlude in the recovery room."



Sending up the sense of helplessness often felt by the guy in the street, Bill Cosby came to power on Novocain. Most comics needle their audience, but Cosby, a famously soothing comedian, built an entire, much-loved standup routine about being needled himself. It starts with "the dentist pulling out a needle *this long* . . . to deaden the pain. And then they want to talk to you." In 2002, the *Pittsburgh Post-Gazette* wrote of Cosby's performance: "Even doing his classic [dentist] bit almost word for word, his impression of a face on Novocain was still the most hilarious moment of the night."

*Novocaine* is the name of Steve Martin's 2001 faux-noir movie about a dentist framed for murder. ("Leaves you a bit numb," wrote *USA Today*.) *Novocaine* is also the title of an acrylic and oil on canvas painting by Minneapolis artist Shawn McNulty depicting a bright, edgy urban scene centered around a red traffic light.

Novocain shines a virtually irresistible light on the moths of music. A host of rock bands answer to the name Novocaine, including current groups based in Atlanta and eastern Tennessee, as well as in Italy, Wales, and Norway. A punk record label from Chicago is called Novocaine Records Inc. Perhaps it's the altered sensation they're all trying to reference, the release from pain, or even a hip, ironic refusal to be silenced.

Novocain also figures prominently in modern music titles and lyrics. A power-pop rock album from Kurt Bordian released in 2000 is titled *Novocaine*. The Kings of Leon, a Southern rock group that pays homage to ZZ Top, christened its 2003 debut album *Holy Roller Novocaine*. Even veteran shock rocker Alice Cooper left the golf course long enough to record an album in 2003, *The Eyes of Alice Cooper*. Track four's title? "Novocaine."

Taking their inspiration from something that deadens, Novocain songs sound surprisingly life affirming. Songwriters offer Novocain as an injection of hope, or at least a call for help. The Eels' 1996 song "Novocaine for the Soul" goes: "Life is hard, and so am I/You'd better give me something, so I don't die/Novocaine for the soul/Before I sputter out." The band Feeder's 1998 song "Crash" includes these lyrics: "She's my hands, she's my hands/Picks me up when I crash down/Builds me wings so I can glide/She's my Novocaine ride."

Go, Novocain. ■