

# CDA

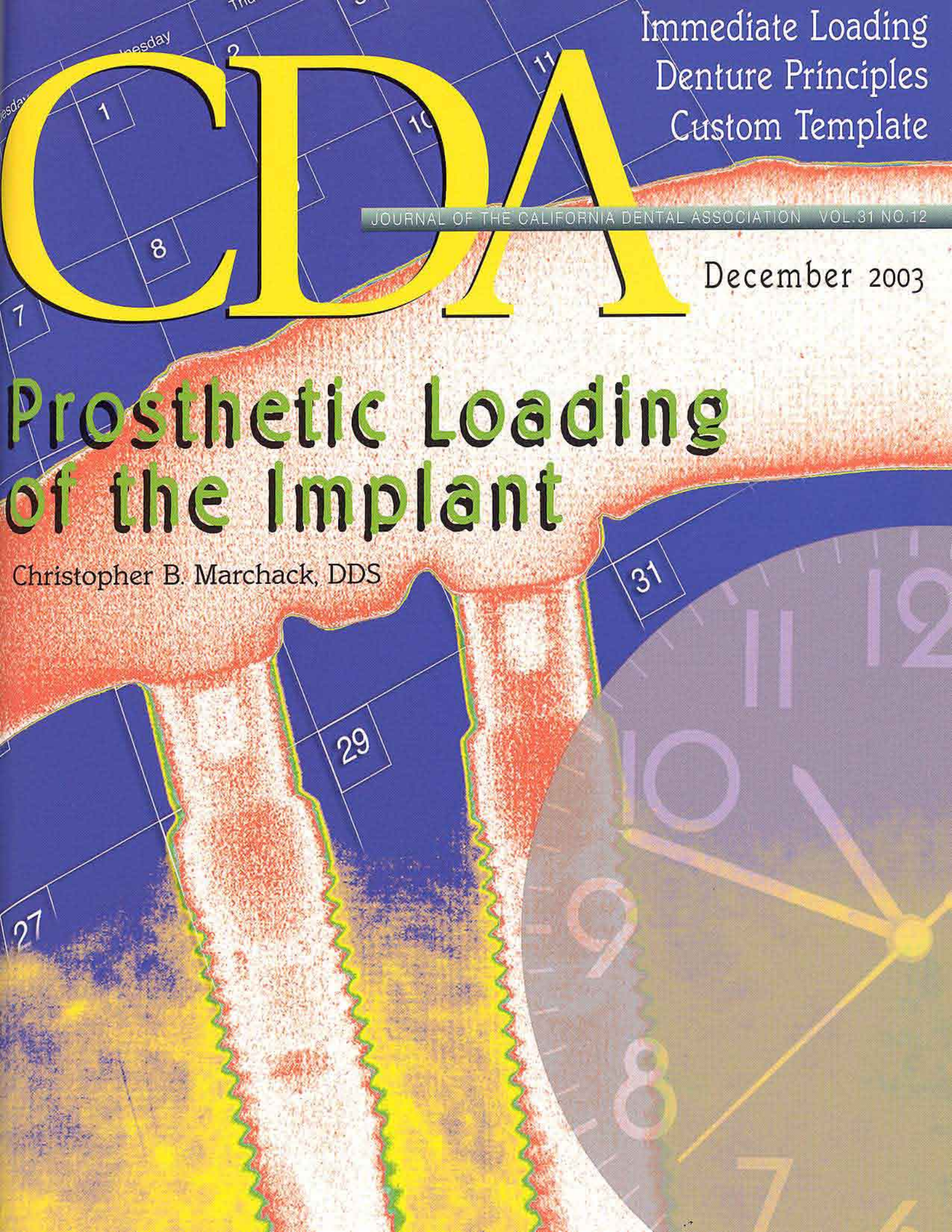
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JOURNAL OF THE CALIFORNIA DENTAL ASSOCIATION VOL.31 NO.12

December 2003

## Prosthetic Loading of the Implant

Christopher B. Marchack, DDS







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Christopher B. Marchack, DDS, and Peter K. Moy, DMD

# Some Other Views of Licensing Examination Issues

We expect that this topic will continue to generate dialogue and debate, so there will undoubtedly be future opportunities to discuss these issues.

Jack F. Conley, DDS



Regular readers of this publication will recall that editorials and commentaries regarding the examination and the examination environment have appeared in this space several times in recent months. This is an important issue for the California profession to digest.

Since the CDA House of Delegates will receive a report from the CDA Task Force on Licensure after this issue of the Journal goes to press, readers can expect continuing dialogue on this important issue either in this publication, or in the CDA Update.

The August editorial in particular ("Harboring Some Ethical Dilemmas," Page 589) stirred concern and debate in the dental examiner community. Readers will recall that the editorial focused on the environment surrounding the examination, including the questionable ethical behavior of too many candidates and the high costs of the total examination process, all in the pursuit of passing.

Members of the Dental Board of California were extended an invitation to respond, and several of those responses are included here. In keeping with our longstanding policy of refraining from debating the positions of responses, we make only one limited comment here for clarification purposes. We expect that this topic will continue to generate dialogue and debate, so there will undoubtedly be future opportunities to discuss these issues.

However, one of the letters states, "It was evident your information is not completely accurate and/or appropriate." As we heard a similar comment also from another source regarding the aforementioned August commentary, readers need to know that comments we made about the behavior of candidates, dental assistants,

and patients came from reliable individuals who have personal integrity and a concern for ethical behavior within the profession. I trust their observations implicitly. To suggest that that information was not accurate or appropriate would be to misinform.

We continue to welcome dialogue on this issue. We believe readers will find these letters informative, if not provocative.

— The Editor

## Exam a Good Tool

**Editor:** On behalf of the Dental Board of California, I appreciate your editorial input in regard to the licensure examinations. The board has an obligation to protect the dental health of the people of our state, and we believe that the current examination is a viable tool for that purpose. We will continue to give the licensure examination until time proves differently.

As far as I know, there are no outcome studies to show that any other method is better than the current examination procedure. Several of the proposed licensure models — such as graduation only, one year of residency, the portfolio method, and others — still have not been shown to be superior to the present method.

We are constantly calibrating our examiners and meeting with the faculties of the five dental schools to make the examinations as relevant, selective, anonymous, and reliable as we can to allow candidates to demonstrate minimum competency.

Thank you again for your input, and we welcome your suggestions.

George M. SooHoo, DDS

Chairman of examinations

Board member, Dental Board of California

## Exam Protects Public

**Editor:** This letter is in response to your editorials in the August and September ("Protecting the Public: Myth or Reality?" Page 651) *CDA Journals*, on the subject of the California licensure examination. The former editorial questioned the ethics of some aspects of the Dental Board of California licensure examination, and the latter questioned whether the examination protects the public. Certainly, these are serious questions for evaluation by the CDA Task Force on Licensure. The focus of the first editorial was in regard to the effect of the examination process on dentists coming into California. Perhaps I can present a different perspective for consideration by you and the task force, as I believe that the very aspects detailed in your editorials actually may be benefits from the perspective of at least some of the candidates. I would also like to comment on other aspects of the examinations that were brought up in your editorials, from the viewpoint of a long-term member of the examining committee (1985) and as an attorney.

The reality is that candidates from outside the state have a disadvantage in regard to taking the licensure examination(s) in California. Non-California trained candidates have no local non-criminal way to practice their skills on patients before the examination, as well as much less knowledge of or access to the examination site, less access to assistants and/or patients, travel expenses, and many other problems. Everyone has the Candidate Guide. Foreign-trained candidates may have additional problems with language, our culture, and more. What do we expect them to do? If I were in that situation, I would be quite pleased that there are assistants who could walk me through the examination process and companies that could legally provide patients for me. That would seem to be money well spent. The alternative would be to bring my patients and/or assistant

from outside California to the examination and do my best by myself.

My perspective on the ethical issue would be in regard to the candidates who resort to unethical and illegal activities to try to practice for the exam, or to obtain patients or assistants. That mirrors the many temptations to be unethical or illegal we all have in practice; but we resist, although the pressures can be great. In contrast, I believe that it would be problematic for the

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**George M. SooHoo, DDS**

board to become involved in any providing of patients or anything else that would give one candidate an advantage over any other, because that would have the appearance of showing bias.

It is true that candidates will compete for the most experienced dental assistant for the procedures required for the clinical portion of the examination. Unless we ban the use of dental assistants (I did not have one when I took the board), it would appear that the competition for assistants will continue, and that assistants will charge whatever rate is established by the law of supply and demand. As is true in practice, some assistants are simply more valuable than others. Certainly the task force can consider recommending some sort of licensure or credential for dental assistants

for the board examinations, mandating a limit on fees charged, limiting the ways that assistants can be selected, or requiring disclosure by the assistant of certain qualifications. So far as I know, the board has not been involved in that aspect of the examination, other than to prohibit using people such as dentists to be the assistant. The examinations are always held at one of the five dental schools, and so it would appear to me that the schools would have the primary ability to provide security rules and regulations on the school property, with approval by the board. Perhaps the recommendations of the task force can be directed to the schools as well.

Candidates will also compete for the best patients; but, there is no reason why a larger than minimal lesion or condition will disadvantage a candidate, as long as the candidate follows the published rules. The rules and the grading criteria for demonstrating minimum competency are known publicly and are modified as necessary after consultation at least yearly with representatives of the five California dental schools. I note that some California dental schools give courses specifically to prepare for the different California licensure examinations, so perhaps the task force can make recommendations for them as well. Those courses are also expensive, but the applicants for the classes think the cost is worth it.

The primary focus of your first editorial was the image presented to candidates coming from outside of California. For a qualified dentist who is foreign-trained (meaning a graduate from a non-accredited dental school), California is one of only three states (the others are Hawaii and Minnesota) that have a process where a candidate can obtain a first license without having to take any additional training in an accredited dental school. If the candidate is qualified, why not let the can-

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*Continued from Page 876*

didate demonstrate that and practice here? California needs qualified dentists. A foreign-trained candidate can obtain a dental license by passing the restorative technique examination and then the general licensure examination. If I were a foreign-trained dentist, I would be thankful that California has given me that possibility. From the perspective of the Examination Committee, the problem is that we do not have enough knowledge of the qualifications of such a foreign-trained candidate, because there may or may not have been a recent accreditation process for the candidate's dental school. It is not unreasonable to worry that some dental schools in the world may not provide adequate training. Given the mandate from the state, the Examination Committee must try to test for minimum competency of foreign-trained candidates as the only screening method for a California license. No examination is perfect; and, as you pointed out, the examination is in constant review; but the fact that California gives such an examination process for the competent foreign-trained practitioner is laudable and, I would think, appreciated by the foreign-trained dentists who want to come here to practice.

In regard to the September editorial, I respectfully disagree with your position that a "snapshot" examination "can tell nothing about the current or future performance in practice." The absence of data does not mean that something is not true, and I contend that common sense indicates that the connection is true. For example, if a candidate demonstrates that he or she can do an acceptable amalgam preparation and filling, that at least indicates that the candidate knows how to do that on that day, and to me gives at least some assurance that the candidate might be able to do it again in the future. If a candidate passes a written examination on a subject, to

me that indicates at least some knowledge of that subject. I agree that if a candidate does not pass the clinical portion of the examination, that is not absolute proof that the candidate is not qualified. However, California needs dentists who are qualified every day, not just on a good day. If the criteria used in the clinical examination to demonstrate minimal competency are valid (if not, they can be changed), then I think we should

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**Arthur W. Schultz, DDS, JD**

expect that candidates should be able to demonstrate that every day, including the day of the examination. The candidate has some control over the selection of the patient and the assistant, perhaps more than will be true in his or her practice, where less ideal patients will still need treatment. If the examination is a "snapshot," it is not a random one, but rather a chance for the candidate to show his or her competency for a chosen real patient in a treatment situation. The California Department of Consumer Affairs mandates that the examination be as realistic as reasonably possible. In that regard, I respectfully disagree with the pundits who decry the use of human patients for the examination. If a candidate is minimally quali-

fied, then the patient will receive at least adequate dentistry on that day, the same as would be true in a dental office if the candidate had not had to take the examination.

If a patient agrees to have a candidate treat him or her, knowing nothing about the candidate except the willingness to pay the patient, then I think the patient would be hard-pressed to complain about the candidate's ability later. Perhaps the task force can make suggestions for forms for patients to read and sign recognizing what they are doing and submit them to the board. If the candidate is not qualified, then it is true that the patient may receive inadequate dentistry at the examination. The whole purpose of the examination is to identify and deny a license to candidates who are not minimally competent. If inadequate dentistry is done, the patient at least has the remedy of going to a licensed dentist for treatment at the expense of the mandatory liability insurance that the board requires of every candidate. My expectation is that the schools would probably be willing to treat emergencies for an adequate fee.

Although no one expects a new dentist to be as capable as one with several years of experience, the law makes no such distinction if a dentist is sued for malpractice. That standard of care is the same for all general dentists. After defending dentists for more than 23 years, I can report that new dentists have a disproportionately high incidence of malpractice claims. The task force should be able to obtain data from The Dentists Insurance Company in that regard if they wish. If anything, that should show us that new dentists need more training and examination, not less. That does not mean that the standards should be higher, just that there be as many methods as possible used to protect the public by making sure that the minimum competency standard is met, with the schools and

the state being independent and cooperative entities. The schools have a dual responsibility, first to prepare students, and then to protect the public by requiring adequate performance. The board is there only to protect the public by requiring adequate performance. With the two, there is more protection than either one alone.

In both articles, you referred to the problem of specialty licensure for new specialists. Since you referred to new specialists, of course you know that specialists with more than five years' experience in another state may be able to be licensed by credential in California. If, for the new specialists, you mean that the board should consider some sort of restricted licensure, I agree that the task force should consider the subject, but I do not believe on first impression that such licensure is feasible. As you know, practicing without a license would be a criminal act. If a qualified oral surgeon were to obtain a license for oral surgery only, then do you mean that doing any other dentistry would be criminal, i.e., replacing a filling that came out during a surgical procedure? What about adjusting an immediate denture after extraction of the teeth? Or doing any dentistry other than oral surgery as that is to be defined? How will such limited-license dentists be presented to the public, i.e. "licensed for root canals only"?

In summary, I believe that the present California licensure examinations are reasonable and necessary exercises of the state's decision to try to protect the public, by requiring that every candidate demonstrate minimum competency in several areas of dentistry at least once to state examiners. Helpful and constructive suggestions on improving the examination from the task force are more than welcome, and I hope that this dialogue will continue.

**Arthur W. Schultz, DDS, JD**  
*Manhattan Beach, Calif.*

## **Live Patients Important**

**Editor:** I was intrigued, to say the least, by your recent editorial about the Dental Board of California clinical examinations. I would like to address some of the issues you mentioned and share with you the following, especially where you discussed issues where it was evident that your information is not completely accurate and/or appropriate:

First, the licensing examination should be just one more step from an educational environment to dental prac-

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**Marlene M. Schultz, DDS**

tice. After all, as you stated, the board examination changes to reflect job-related procedures. I find it sad, however, that when the board ceases to test something, the schools no longer teach it (i.e., gold foil and denture set-ups). The examination should be neither "unpleasant" nor "unprofessional."

Second, let's consider the cost of the examination. The board's fee for the exam is much less costly than many of the other board examination fees. A candidate does not need a high-priced, experienced dental assistant to get through the examination "minefield." Ninety percent of the things a candidate needs to know to progress through the examination smoothly are contained in the Candidates Information Guide that is sent to every candidate prior to the exam-

ination. The other 10 percent are things that may be procedural items told to the candidates at orientation. We have heard students say that they don't have time to read the Information Guide. (They do have time to retake the exam though!)

One solution to reduce the cost of the examination would be for the candidates to work without assistants. I'll bet you took the examination without an assistant as I did! This would help also to "level the playing field." There have been times when the so-called experienced assistants have given misinformation to the candidates. This can add to confusion and stress for a candidate.

As to the cost of patients, a great number of the candidates use friends and family members as a source for patients. The average time period, according to a recent survey, that candidates used to search for a patient was two weeks prior to the examination. Family members and friends are people who want the candidate to pass, so they tend to be most reliable and loyal to that candidate. I would encourage candidates to have family members or friends pick up the patients for the examination and sit with them in the reception area.

The current board president, board members, and examiners abhor the selling of patients and do try to stop this practice. At one exam during 2003, Dr. Charles Goodacre, dean at Loma Linda University School of Dentistry, personally went into the lobby and school perimeter to have security escort and ban two individuals and their groups from coming onto the campus then and in the future. At one school, however, during the last examination, there was a huge sign directing candidates to obtain "prescreened," "preauthorized" patients at a room in the dental school. This was a room that the school had rented to individuals for patient sales (this is as told to Dr. SooHoo at that examination and witnessed by examiners). This occurred after the dean had made it clear to board representatives that



he was opposed to this practice (a meeting at which I was present).

Third, as far as finding the “ideal tooth and lesion,” the candidates must have a misconception. They have been told, as have the educators at the meetings between educators and examiners, that there is no need for a very small, ideal lesion. In fact, the choice of a lesion that is very tiny and requires no extension requests from the clinical floor examiner should end up being an ideal minimum preparation when it is presented to the examiners for grading. However, when a preparation requires legitimate multiple extensions due to decay, decalcification, or other reason, then most probably the preparation will be graded by an examiner as the candidate’s good judgment in handling that particular situation. In reality, by picking the smallest acceptable lesion possible, candidates make it more difficult for themselves. How a candidate handles a situation is what is important.

It has been suggested that local dental society members locate patients for candidates graduating from their alma maters. I know that every day in my practice I see at least four to five lesions that would be very acceptable for the examination. Unfortunately, I am prohibited from sharing these patients.

The Informational Guide has been criticized as not being as detailed as the Western Regional Guide. It is true that there are fewer pictures. Students have requested that pictures of decay to the dentinoenamel junction be included! If a graduate does not know what the DEJ is by the time he or she graduates, they have bigger problems than we are talking about here.

At each examination, we understand that questions are stolen or photographed by pen cameras. I have heard that it is possible for candidates to buy this information to prepare for the examination. You did not mention

this in your total cost estimate for the examination. Candidates even cheat on the law and ethics examinations! The board is addressing these issues and is modifying the examinations.

Let’s talk about other examination stresses. The cost of education is enormous. In some cases, mother and father, as well as the candidates themselves, have put out a quarter of a million dollars in cash or loans for three to four years of education and want their offspring to pass the examination to practice and in fact can’t figure out

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***Lu Lau, Lu Lau Dental Services***

why their child cannot pass. The prospect of an additional year is overwhelming, cost-wise. We have heard rumors too about a student being accepted at a local school who had a 1.0 grade average but whose father made a large donation to that school. What chance does this individual have of competing with his classmates or for eventually performing at a state exam?

Something is amiss in the educational system when after graduation a student cannot produce a minimally competent preparation on a tooth. Is it the original student selection process by the schools? Is it the need to promote because the schools need the money

and can’t afford to drop a student? Is it fear of a lawsuit that keeps the schools from telling students that they are not capable? Candidates have always needed to pass the first time! If you compare what the cost of tuition is today with what it was 25 years ago, you will find it is proportionally the same.

Fourth, you mentioned the aftermath of the examination. To begin with, candidates must purchase insurance to cover the aftermath complications before they can take the examination. Things can happen in this arena just as in private practice. After a recent survey of the candidates at the schools, it became evident that this is a tiny problem as there are very few patients requiring follow-up care. Patients are aware and sign a disclosure statement to the effect that the candidate is unlicensed before the examination.

Fifth, you brought up the subject of patients being lured to other candidates and how “unfair monetary demands for patients” affect the trust of some colleagues for all time. Yes, indeed, this is a problem not only at the examination but also as a part of practice. Look at the closed panels, DMOs, coupons in the paper, and the acceptable advertising that occurs for competition for patients. To be successful, one must build a patient-doctor relationship. The choice of patients for the examination is important. That emphasizes why a family member or friend as a patient or as a chauffeur for the candidate’s patient is a good idea. The obtaining of patients is not a board function, and any tampering in this arena could show bias on the part of the board.

This subject dovetails into the occasional suggestion (especially by students) to have a nonpatient-based examination. The failure rate could drastically increase because of the difficulty in working on a manikin and preparing typodont teeth. Probably most importantly, this would not be a test of how can-

didates manage patients, anesthesia, or a sterile instrument setting. These are all important parts of patient care. This also does not address the issue that cutting on an ivory tooth is not the same as cutting a real tooth. The amalgam portion has always been the highest failure rate portion for the clinical exams. This was true even when foil and cast restorations were on the examination. In many ways, the examination is easier now than in the past. The technical ability needed to do the foil restorations is no longer required. I am sure that many practicing dentists do not know that the composite (Class III or IV) is now a portion of the examination in place of the foil or casting to make the examination more job-related.

Currently, the board is attempting to work with the schools and vice versa. CDA has its own internal problems as well as other agendas. It is common knowledge that membership is an important issue for CDA at this time. CDA is looking forward to new graduates as a pool for new membership, and it has been said that supporting the position that California graduates should be licensed by the schools is one way of making CDA look good to this pool. If you ask any student, "Would you like to take an exam (to be able to practice)?" you know that no one would choose to take an examination.

Sixth, you missed one huge expense that occurs all too frequently, and that has to do with courses outside of the regular curriculum on how to pass the California board examination at a fee of \$3,000 to \$6,000. One such individual who teaches these courses has also shown at recent meetings that he does not have all of the answers either! This does show, however, that perhaps students are not well enough prepared by the schools for the examination. I ask you, why, after three to four years in school, are candidates not able to produce a minimally competent preparation?

In addition to the issues you mentioned above, you did not factor in the impact of the foreign graduates on the examination. It would be in the best interest of the schools and CDA to get involved with the legislation proposed. Currently, there is important legislation being developed in this regard. The board is making every effort to work with the Legislature by maintaining communication, the goals being to protect the public and ensure that the licensees are adequately prepared.

One area you mentioned in your editorials is the pass rate for the examinations. I personally have heard Dean

## The state board exam is the worst possible example we could be setting for young dentists.

*Larry Jenson, DDS, MA*

Harold Slavkin of the University of Southern California School of Dentistry on two separate occasions announce that students pass the examination at a rate of 98 percent. I found that figure misleading, because it appears to mean the pass rate for each exam instead of a cumulative one, which could be many exams over a period of years. In addition, I would assume that repeat candidates would have more education specifically directed toward passing the examination.

Most schools do not allow all of their students to take the exam when it is first given after graduation. Second, failures occur for some of those allowed to take the exam. Third, some people choose not to retake the exam and move out of state. Examiners used to be

given the percentage pass/fail rates of previous exams at orientation meetings by the individual who calibrates the examiners before each examination. A few years ago, the board was asked that this information not be made public. Why don't you ask the board to make these figures public? I have figures in my notes dating back to the late 1970s. The pass rate during this time has never been 98 percent for any exam or for any year. (There is one exception and that was for the June 17-19, 1980, examination where only one UCSF student took the exam and passed.) You may want to look at your past *CDA Journal* publications, for example the October 1980 comment by Dr. Robert Sachs, CDA "FollowUp" from January of 1981 by the Consumer Advisory Board chairman, a letter in response by Edwin Schweiffler from January 1981, the *CDA Journal* Opinion by William Lannan dated April 1981, and an April 1981 *CDA Journal* response from Edwin Zinman. Some of the current issues are discussed. In addition, at every examination in the area of failures, there are always wrong teeth (those not approved) prepared and mechanical exposures (tooth with a small lesion where the candidate has cut into the pulp) etc. Finally, the schools should have to give all of the information on pass rates, not just on one aspect, such as cumulative pass rates. This information should be public knowledge.

Dr. Slavkin talks about patient treatment of the future and how caries will not be a problem with some of the technological advances that are in the process of being developed. Students need to be taught how to treat patients now not just how to pass the exam now.

Another area that warrants mention is the subject of the overall attitude of some of the candidates. Frequently, they tend to disregard instructions given to them. The incidence of altered (manufactured lesions) X-rays, etc. exists. Simple in-



structions such as “no cell phones, recorders, pagers, etc. on the clinic floor” are given both in writing and orally; but candidates sometimes choose to ignore them and become arrogant and rude when they are found with these devices.

I am sure you are aware that the board does everything possible to help prepare candidates for the examination such as the presentation for candidates by board members and members of the Examining Committee at the CDA Scientific Session in Anaheim. The exact dimensions of the preparations are given to the candidates and are shared with the educators at yearly meetings. The criteria are based on what is currently being taught and

changes as the education of the students change. I might add that when evaluating candidates' performances, the examiners always attempt to err on the side of the candidates. The examiners who are present to certify the actions of the candidates on the clinic floor make every attempt to be helpful in procedural matters and maintain a calm atmosphere to facilitate the examination process. It is not unusual for candidates to thank the clinical floor examiners after the examination.

I believe that the public would never support the concept of “no examination” for recent graduates by a licensing agency. When I have mentioned to my patients that the licensing of dentists could be done without an

examination, they are outraged! Every profession that I know of has some kind of proficiency examination.

Everyone would like very much for graduates to pass the examination: the candidates, their families, the schools, and particularly the examiners. However, protection of the public is the primary goal of the people who administer the examination. The candidates have to exhibit competency, and the license is just one more step in the process to the practice of dentistry. The examiners continue to be a part of the examination process to make the exam the very best possible. We have no hidden agenda.

**Marlene M. Schultz, DDS**  
*Manhattan Beach, Calif.*

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## Supply and Demand

**Editor:** The Dental Board of California has created some unintended strong market forces, through its licensure examination process, that are classic supply and demand. I wish to comment on your recent editorial, "Harboring Some Ethical Dilemmas."

As long as there is a live-patient examination where a major success variable is the type of patient for a specified clinical procedure — currently amalgam, composite, and perio in California, and similarly elsewhere — there will be a demand for patients that meet the Dental Board's criteria for acceptance. Whoever supplies a service associated with this clinical procedure is engaging in behavior that is reflective of our society's free-market economy. Fees associated with such a service are value-driven. If the fee is perceived as fair, that business will continue to exist. Word of mouth becomes a strong market influence.

I am the owner of a business that provides such a service for licensure candidates. My business prescreens patients for the specified clinical procedures required by the Dental Board and helps candidates negotiate what you describe as the examination "minefield." I create the logistical arrangements to ensure that a candidate may undertake the examination process with a peace of mind that a quality, prescreened patient can provide. I believe that my business fulfills a need within our society by offering a valuable and ethical service to licensure candidates, patients, and the dental profession.

I do not advertise my business, but rely on word-of-mouth referrals from satisfied customers — licensure candidates from past dental examinations. My service allows the candidate to focus on the technical performance the Dental Board requires, and not be distracted by the logistics of patient selec-

tion, transportation, reliability, and so on. My business expends tremendous time and effort to ensure a quality patient is present during the examination. Candidates choose my service usually after they have tried unsuccessfully to secure a suitable patient through other means. During the examination, I even have a back-up patient available should the Dental Board reject the first patient.

The patients that my service provides for licensure candidates are typically those who have not entered the dental mainstream and sought proper dental care. In somewhat of an unusual twist of fate, the Dental Board has, in effect, provided them with access to care. These patients have oftentimes been living with years of dental neglect and now have the opportunity to start on the road toward dental health. Patients usually meet their candidate prior to the examination and establish a relationship that is invaluable during the actual clinical examination. They are not just a tooth or a mouth.

My business has a commitment to provide a quality service for the dental profession. Just as the vast majority of CDA member dentists have to operate a business, I too must do the same and follow similar rules. I work with licensed dentists who diagnose and treatment plan potential patients. All patients are screened for their health history, presence of dental conditions, and willingness to participate in the licensure examination. All licensure candidates who work with me must be qualified according to the Dental Board's criteria and provide proof of liability coverage. After the examination, I ensure that the patient has received proper care. If there is a problem, I refer the patient to a licensed dentist to evaluate and, if necessary, correct the dental treatment. This possible treatment is part of my overhead expense and included in the fee I charge licensure candidates.

All in all, my business exists to fill a demand that the Dental Board has created through its clinical licensure examination process. Change the process and I'll change my business but still strive to operate in an ethical, legal, and quality manner.

**Lu Lau**  
*Lu Lau Dental Board Services*  
*Los Angeles, Calif.*

## Patient Use Unethical

**Editor:** I read with great interest your article in the August issue regarding the use of patients on the California licensing examination. As a teacher of general dentistry and dental ethics at the University of California at San Francisco, I agree with your assessment that the state board exam is the worst possible example we could be setting for young dentists. The board's irresponsible treatment of patients cannot be justified on any grounds. Those who support the continued use of patients have many reasons to resist this change, most boil down to either a fear of competition or a self-righteous sense of privilege that they had to go through this "right of passage" so others must also. Neither of these "reasons" does much to set an example of high ethical standards for the profession. I am impressed by the fact that the ADA has had the courage to come out against this practice, but much more activism is needed to change the status quo. The good news is that the New York State Dental Association was able to change that state's board examination, eliminating the use of patients. They set a great example for us here in California. I encourage CDA to follow this example and show our young professionals that professional ethics really do make a difference.

**Larry Jensen, DDS, MA**  
*Interim chair,*  
*Division of Clinical General Dentistry*  
*UCSF School of Dentistry*



Illustration: Matt Mullin

## Translated Health Forms Help Cut Through Language Barrier



he University of the Pacific School of Dentistry and MetLife recently announced the translation of a health history form into 21 languages in an effort to serve better the diverse communication needs of dentists and patients by expanding an effort begun in the *Journal of the California Dental Association*.

"In order to accommodate the growing diversity of society, we recognized there was a vital need to have patient medical health information readily available in multiple languages and collaborated with the California Dental Association and MetLife to fulfill this need. Because of the uniform questioning sequence, these health history translations can actually be used by pa-



**“Diversity in ethnicity, culture, and language enriches our lives, but also adds a challenge to communicating important health information that is vital to the safe delivery of dental care.”**

**DR. JAMES KENNEDY**

tients and doctors all around the world,” said Peter L. Jacobsen PhD, DDS, director of Oral Medicine, University of the Pacific School of Dentistry.

The translations are available in Arabic, Chinese, Creole, English, Farsi, French, German, Hebrew, Hmong, Italian, Japanese, Korean, Laotian, Polish, Portuguese, Russian, Spanish, Swedish, Tagalog, Thai, and Vietnamese. Eleven more translations will be issued later this year.

The health history forms can be downloaded — free of charge — as a PDF file from MetLife, [www.MetDental.com](http://www.MetDental.com), as well as from the University of the Pacific’s web site, [www.dental.uop.edu](http://www.dental.uop.edu) under dental professionals.

The easy-to-use forms are separated into areas related to medical signs and symptoms, diagnosed diseases, specific medical treatments and medicines that could influence the diagnosis of oral diseases and/or modify dental therapy. The order of questions remained the same when the English-worded form was translated into the other languages. Patients answer the questions

by circling “yes” or “no” on the form. This enables the dentists to compare the form in his or her native language to that of the one used by the patient.

The translations represent 87.7 percent of those languages spoken across the nation, according to the 2000 United States Census. An estimated 32 million people in the U.S. use their native language in their homes.

“Diversity in ethnicity, culture, and language enriches our lives, but also adds a challenge to communicating important health information that is vital to the safe delivery of dental care. The Multi-Language Health History forms will enhance the quality of oral health care by helping patients, regardless of their native language, communicate more effectively with their dentists,” said Dr. James Kennedy, dean emeritus of the University of Connecticut School of Dental Medicine and chair of the MetLife Dental Advisory Council.

Created eight years ago, the MetLife Dental Advisory Council is made up of practicing and academic dentists overseeing MetLife’s Quality Initiatives Program.

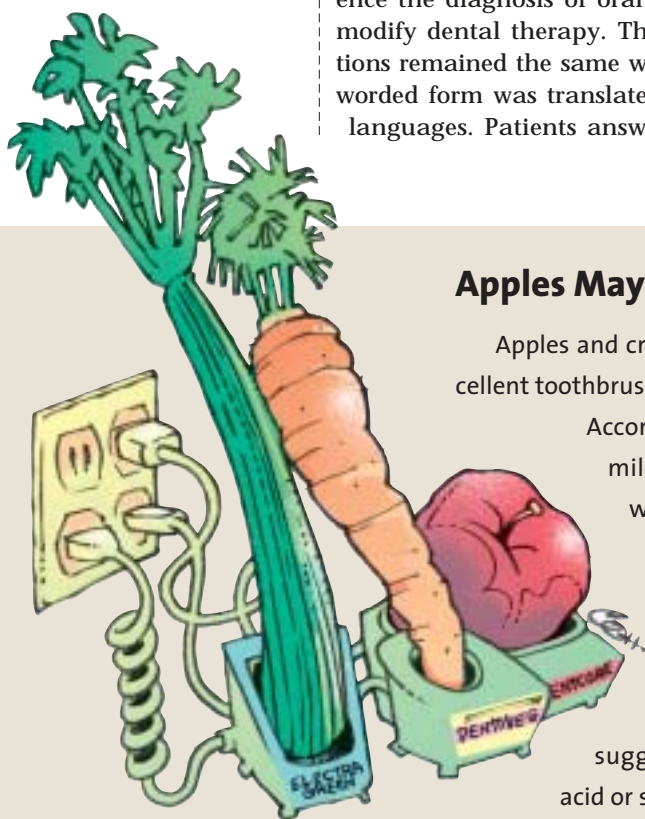
## Apples May Be a Toothy Solution

Apples and crispy, wholesome veggies such as celery and carrots can be excellent toothbrush substitutes.

According to a September 2003 Prevention magazine article, “The mildly acidic nature and astringent quality of apples, combined with their rough, fiber-rich flesh, makes them the ideal food for cleansing and brightening teeth,” said Jeff Golub-Evans, DDS, a cosmetic dentist at New York University.

Munching apples, carrots, celery, and other crunchy nutritious foods helps brush off stains over time.

If one is unable to brush after eating an apple, the article suggests consuming a glass of water to wash away any plaque, acid or sugar from the enamel.



## The Myth About Dentists That Won't Go Away

Although the notion is patently false and no legitimate data supports it, the myth that dentists commit suicide at a higher rate than the general population just won't go away, wrote Janet Walzer in *Tufts Dental Medicine*, Vol. 7 No. 2, summer 2003.

The idea that dentists commit suicide more than any other group in the population has been the subject of discussion since the 1930s. That this falsehood has stuck all these years demonstrates the difficulty of changing perceptions, Walzer writes.

In her article, she noted that modern dentists are armed with the latest technology, are less isolated than before, spend much of their time cultivating good relationships with patients and associates, and participate in continuing education and alumni activities. All these go a long way in counteracting the myth, and, she wrote, the public appears to be moving toward a more realistic view of the dental profession.

According to Walzer's article, many dental professionals — from students to practitioners — are actively promoting the profession and debunking archaic stereotypes. However, this may not be enough, as the news and entertainment media have been slow to alter their focus. She discussed several of the television and movie portrayals of dentists. And she cited a study done by Dr. Todd Walkow, a 1996 Tufts dental graduate.

While a student at Tufts, Walkow wrote a research paper on the media's portrayal of dentists. Walkow reviewed hundreds of articles written over a five-year period. He found that "overwhelmingly, the content was negative, and it was statistically significant."

Yet, Walzer writes, the dental profession is full of happy and fulfilled people —



a perception that dentists have of themselves. This positive self-image is good news for the public. As Walkow pointed out, "The more we educate the public about the current state of dental practice, the more the public will benefit from good oral health."

## Good Outlook for Dental Spending

Although the U.S. again is experiencing an economic downturn, history has shown the economics of practicing dentistry will withstand and continue to thrive. So much for yesteryear's headlines, including the Farmer's Almanac, declaring the impending end of the dental profession because of the extended duties for auxiliaries and shifting oral disease patterns.

In the July issue of *Texas Dental Journal*, H. Barry Waldman, DDS, MPH, PhD, wrote about his review of reports from government agencies and the American Dental Association on spending for dental services during good and bad economic times. The result revealed that while some areas will be harder hit and some practitioners may experience decrease in activity during hard financial times, the overall outlook is positive.

Spending for dental services, at the end of World War II, was approximately less than a billion. In 2000, the figure was \$60.7 billion, said Waldman, noting that current spending per active dentist went from \$11,900 in 1950 to \$365,000 fifty years later.

Several factors contribute to this optimistic view, Waldman said. Among them is the continuing decrease in the ratio of the population to dentists, the maturing "baby boomer" generation's demand for services, as well as the services needed for groups including the underserved, minorities, and those with developmental or other disabilities.



"The purpose  
of life  
is to live it,  
to reach out  
eagerly  
and without fear  
for newer and  
richer experience."  
Eleanor Roosevelt

## Augmentation of Sinuses Can Help With Implants

Sinus augmentation with autogenous bone may assist the placement of dental implant rehabilitation although the method is not predictable, according to a study in the *International Journal of Oral and Maxillofacial Implants*, Vol. 18, No. 3, 2003.

The researchers said the procedure of sinus augmentation utilizing autogenous bone grafting may boost bone volume to allow implant placement where there is not enough bone. The survival of implants in grafted bone, as measured by successful loading and integration, was lessened compared to implants in normal maxillary bone, said researchers. The study also revealed that infection of the grafted site during healing reduced the success of ensuing implant osseointegration.

Researchers at the University of Sheffield, U.K., looked at 27 sinus augmen-

tation procedures on 18 patients whose average age was 43.7. Thirteen patients had a typical bone graft consolidation period of 24.7 weeks before implantation; six patients had implants at the time of grafting. After an average follow-up period of 162 weeks, 16 of the implants fell short of integrating in grafted bone, signifying a survival rate of 80.25 percent.

The outcome, conducted in typical dental implant practice, showed the survival of implants in grafted bone of the maxillary sinus to be lower than in comparable studies. Meanwhile, a larger proportion of implants were integrated in grafts following a healing period compared to those set at the time of graft surgery, the researchers said.

The authors suggest using a bone graft healing period before implant placement and not using membranes.

## Study Evaluates Sleep Bruxism in Implant Patients

In cases where sleep bruxism is suspected, researchers recommend polysomnographic analysis, which is cost-effective and efficient.

Sleep bruxism, distinguished by clenching or grating teeth during slumber, may place pressure upon the supporting bone and result in damaging lateral stresses and possible bending overload, wrote researchers at Istanbul University, Turkey, in a study published in the *International Journal of Oral and Maxillofacial Implants*, Vol. 18, No. 3, 2003. Abnormal occlusal stress or overload-ing implants could lead to implant failure.

Although precautions against sleep bruxism in patients who have dental implants have not been clarified, there appears to be some validity to night guard protection.

Nearly everyone experiences sleep bruxism at one time or another, authors said, noting research relative to sleep bruxism and endosseous implants is rare. Clinical diagnosis of sleep bruxism, they said, is based on orofacial examinations and supplemented by patient history, parental or self-reports, which can be misleading for the clinician.

The researchers' goal in this study was to evaluate the utilization of polysomnography to assess the clinical findings of dental implant treatment in patients with sleep bruxism as well as validate occlusal symptoms. In the study, 19 patients presented with implant treatment complications, six of whom were identified with sleep bruxism by masseter EMG.

Researches suggested clinicians should consider the possibility of bruxism in the cases of mechanical complications such as loosened gold screws, occlusal surface wear and damage, or abutment fractures.





## The Flu and You

The American Lung Association recently created a feature on its web site to assist people in finding the nearest flu vaccine facility. This can be especially helpful for asthmatics who the lung association highly recommends the vaccination.

Visitors to the web site, [www.lungusa.org](http://www.lungusa.org), simply type in their ZIP code or area code. The "Flu Shot Locator" then provides local sites where the vaccine is administered, as well as helpful tips for dealing with the flu and preventive measures to stay healthy.

Influenza can become life threatening. Symptoms include fever, chills, sore throat, coughing, loss of appetite, body aches, pains, and weakness. In the lungs, the virus can damage the lining of the respiratory tract. Healing of the inflamed tissue takes at least two weeks.

"Despite the risks, currently only 10 percent of children and 39 percent of adults with asthma get vaccinated for the flu each year," said Norman H. Edelman, MD, scientific consultant for the American Lung Association. "People with asthma are most at risk for serious complications, some of which can lead to hospitalization. In order to protect themselves and those around them, it is necessary that they receive a flu vaccination."

In addition to asthmatics, other high-risk groups who could benefit from the flu shot are those with persistent respiratory conditions such as emphysema, bronchitis, bronchiectasis, tuberculosis, or cystic fibrosis; heart disease; kidney disease; diabetes or other chronic metabolic disorder; severe anemia; and diseases and treatments that depress immunity. Health-care workers also are urged to obtain the flu shot.

Last year, there were more than 65,000 fatalities from both influenza and pneumonia. Of that total, 1,765 deaths were attributed to the flu. According to the lung association, the combination of influenza and pneumonia has been ranked the seventh-leading killer in



America, and the fifth-leading cause of death for U.S. citizens over the age of 65. What's more, children under the age of 2 are just as likely to require hospital attention as the elderly.

Regardless of age, the lung association recommends the flu vaccination for people with chronic respiratory conditions. However those who shouldn't be vaccinated are individuals allergic to eggs (which are used in making the vaccine injection), those with a high fever, or people who have had a negative reaction to previous flu injections.

The best time for a vaccination is in October or November, however December or later can work just as well. The worst side effect may be a sore arm from the injection. The nasal-spray version could cause a runny nose, sore throat, cough or nasal congestion. Allergic reactions to the flu vaccine have far fewer risks of complications than having influenza. And while there is a slight possibility the person receiving the vaccine may get the flu, he or she will be markedly less sick than someone who did not get the shot, according to the lung association.

**"Despite the risks,  
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**NORMAN H. EDELMAN, MD**

## Correction

Table 1 from "3-D Volume Imaging for Dentistry: A New Dimension," by Robert A. Danforth, DDS; Ivan Dus, MD, DDS, PhD; and James Mah, DDS, MS, DMSc, in the November 2003 issue on Page 821 contained an error. For ease of comparing the different systems, the entire corrected table is reprinted here.

Table 1

### Comparison of Maxillofacial CBVT Devices

Parameters	Newton 9000	Newton Plus	3DX Accuitomo	ISI/CAT	Hitachi MercuRay	MedicalCT
X-ray beam	cone	cone	cone	cone	cone	fan
Sensor detector	area	area	area	area	area	linear
	image intensifier CCD	image intensifier CCD	image intensifier CCD	amorphous silicon flat-panel detector	image intensifier CCD	Solid state or gas
Grayscale	8 bit	12 bit	8 bit	12 bit	12 bit	12 bit
Voxel size (mm <sup>3</sup> )	0.265	0.07-0.20 (variable)	0.125	0.4 typical 0.2 minimum	0.1	0.3 <sup>16</sup>
X-ray source			direct current	direct current		
anode	fixed	fixed	fixed	fixed	fixed	rotating
kVp range	110 (fixed)	110 (max)	60-80	120	70-100	110-140
mA	10 15 max		1-10	1-3	to 15 max	80-300
Image acquisition	panoramic type	panoramic type	panoramic type	panoramic type	panoramic type	axial slices
	single 360°	single 360°	single 360°	single 360°	single 360°	multiple 360°
	rotations	rotations	rotations	rotations	rotations	rotations
Patient position	supine	supine	seated	seated	seated	supine
Image area	maxillofacial	maxillofacial	maxillofacial	maxillofacial	maxillofacial	entire body
Dimensions (cm)	13x13 (height x diameter)	22x25 (height x diameter)	3.0x4.0 (height x diameter)	2 versions 11x17 17x17 (height x diameter)	D mode 5.12 P mode 11.7 C mode 15.0 (height only)	varies/exam
Imaging session (sec)	75	30 or less	17	40 or less	9.6	varies/exam
Effective dose* (max & mand) mSv	.04-.05 <sup>15</sup>	.01-.02	.0074	not available	not available	.289 low <sup>17</sup> .723 high <sup>17</sup>
Auto exposure control	smart scan yes	smart scan yes	no	not reported	not reported	no
Commercially available	yes	end of 2003/early 2004	yes	projected 2004	not reported	yes

\* Effective dose as reported is provided from the manufacturer and is not truly comparable to other devices due to variable such as different size of imaging volumes and operational settings of the devices.

# Prosthetic Loading of the Osseointegrated Implant

Roy T. Yanase, DDS

For more than 25 years, P.I. Brånemark has been documenting the phenomenon that he called osseointegration. The success of his original two-stage surgery with delayed loading of the healed implants yielded a predictable high rate of success for implant dentistry. He continues today with the Novum concept that allows a patient to receive a definitive metal-reinforced prosthesis in one day. The prosthesis is supported by three special implants. The surgical stages and time requirements (three to six months) for osseointegration have not changed. The current emphasis on earlier loading places an additional burden on the clinician. Instead of the restoration maintaining stable, provisionally restored implants, the prosthesis must now avoid any micromovement during the healing process that will prevent the integration process from continuing to full maturation. Today, studies continue on the ability of a patient to receive an incision-free, immediately placed and loaded definitive prosthesis in less than an hour. Whether the prosthesis is placed in a few months, a few days, one day, a few hours, or even one hour, certain prosthodontic principles remain paramount for every restoration.

In this issue, we examine the role of complete denture principles in implant dentistry. It is imperative that fundamentals of esthetics and removable prosthodontics be used as core values for the restoration of implant-supported restorations. We will look at principles for patient treatment with immedi-

ately loaded prosthesis. We will look at advanced concepts in the development phase with preplanned surgical guides and prefabricated prostheses.

New paradigms for earlier loading have been developed to create an option to the original two-stage, three- to six-month protocol. Brånemark's machined titanium surfaced implant fixture remains the gold standard to which all other techniques must be measured. One-stage surgery has proven equally successful to the two-stage protocol. Most implant companies offer a variety of options for tapered implant shapes; and textured, passivated, oxidized, and non-oxidized surfaces appear with specific sizes for the surface texture. The conditions of the site selection can be studied in advance in Hounsfield units with computer tomography scans, and primary implant stability can be measured in Ostell units using radiofrequency analysis machines. The common factor seems to be the elimination of micromovement with primary stability and functional overload during the early phases of osseointegration. If optimum conditions are not present, the proven conservative approach must be relied on for long-term success.

There are few controlled studies with standardized protocols on immediate loading. The concepts of immediate loading are relatively recent in application; and, in the rapidly advancing field of implant dentistry, we find that we need to define the procedures we are talking about to compare similar techniques and experiences. All too often terms are introduced to define a particular patient treatment or technique with-

out reference to standard recognized nomenclature. Such references to obsolete terms only indicate a lack of review of current published articles and nomenclature that has international understanding and meaning. Every effort should be made to improve and standardize the generic nomenclature that will advance the progress of implant dentistry.

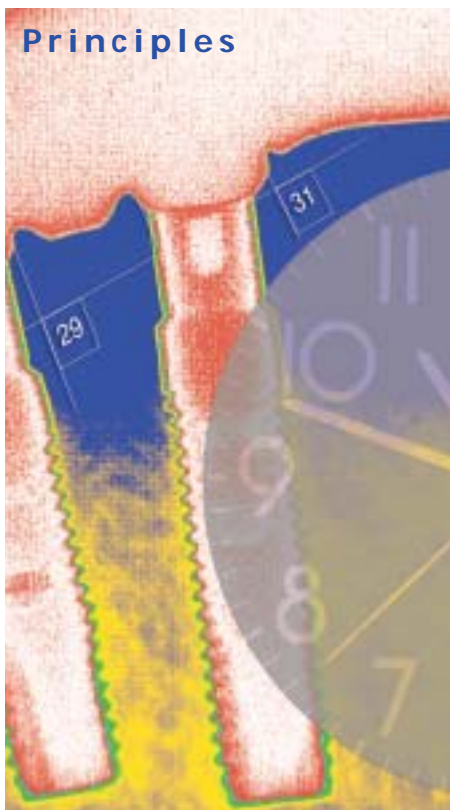
Among the related terms that are misinterpreted are immediate, early, delayed, or progressive functional loading. Relative to the prosthesis, one could be an interim, provisional, temporary, or definitive. Surgical placement could be immediate, delayed immediate, or delayed after healing from extraction. The prosthesis could be an implant single tooth, implant fixed partial denture, complete arch prosthesis, fixed complete denture, or implant overdenture.

The broad spectrum of science, research, and techniques that has evolved from the early applications of osseointegration is truly remarkable and represents areas of ongoing studies in genetics, cellular physiology, and functional biomechanics. The term "osseointegration" has expanded the horizons for research and improved clinical success for all areas of clinical dentistry as well as parts of the human skeleton where there is bone and the potential for an implant-supported prosthesis. **CDA**



**Author /** Roy T. Yanase, DDS, is a co-director of the New Odontic Seminar at the University of Southern California School of Dentistry.





# The Role of Complete Denture Principles in Implant Prosthodontics

Steven J. Sadowsky, DDS

## Abstract

During the past 30 years, there has been a growth of implant courses in dental schools at the predoctoral level to meet a burgeoning demand. At the same time, there has been a concomitant reduction in curriculum time devoted to clinical and technical aspects of complete denture construction. There will be a sizable cohort of patients with limited natural dental landmarks seeking implant reconstructions that may be difficult for the general practitioner to restore. This article reviews basic prosthodontic principles and procedures that are important to understand when designing an implant prosthesis.

During the past 30 years, there has been a growth of implant courses in dental schools at the predoctoral level to meet a burgeoning demand.<sup>1-5</sup> At the same time, there has been a concomitant reduction in curriculum time devoted to clinical and technical aspects of complete denture construction.<sup>6,7</sup> This lack of emphasis on removable prosthodontic principles may be the result of speculation that the need for dentures will decrease markedly in the future. However, Douglass and colleagues<sup>8</sup> projected an increase in adult population needing at least one denture from 33.6 million in 1991 to 37.9 million in 2020. Therefore, there will be a sizable cohort of patients with limited natural dental landmarks seeking implant reconstructions that may be difficult for the general practitioner to restore. This article reviews basic prosthodontic principles and procedures that are important to understand when designing an implant prosthesis.

## Vertical Dimension

Treatment planning for a complete arch implant prosthesis includes de-

ciding between fixed or removable designs and engineering the surgical position of the implants. One of the most important factors in these determinations is the space available for the implant components and restorative material. Using a reliable method for establishing the vertical dimension of occlusion is essential when natural tooth stops are lost. The physiologic rest position was suggested for this purpose in 1934.<sup>9</sup> This is a position of the jaw when the muscles of mastication are in a state of mild tonic contraction. Niswonger recommended subtracting 3 mm from this facial measurement for the vertical dimension of occlusion in Class I patients. Class II patients will require more interocclusal space, and Class III patients may need less than 1 to 2 mm. Other authors have contended that the rest position is dynamic.<sup>10,11</sup> Silverman<sup>12</sup> provided another guide to vertical dimension of occlusion by assessing the closest speaking space. He found that in



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## Principles

most patients with a natural dentition the incisal edges of the mandibular anterior teeth should be slightly lingual to the maxillary incisal edges and between 1 to 2 mm apart when pronouncing the sibilant sounds. Shanahan<sup>13</sup> maintained that the eruption of teeth is held at the occlusal plane by the act of swallowing, establishing the vertical dimension of occlusion, and is unchanged after extractions. Tallgren<sup>14</sup> preferred a combination of mild fatigue followed by swallowing and relaxation with eyes closed. Pound<sup>15</sup> used a phonetic method of the /m/ sound and engaging the patient in conversation before establishing rest position. Babu and colleagues<sup>16</sup> showed that determination of vertical dimension of rest using swallowing and phonetic techniques was more accurate with a patient's denture in place. Willis<sup>17</sup> popularized a facial biometric measurement. He related that the distance from the pupil of the eye to an imaginary line coincident with the commissures of the lips should equal that from subnasion to gnathion. A combination of methods may be necessary to arrive at appropriate facial contours and sufficient interocclusal distance.

### Restorative Space Allowance

AbuJamra<sup>18</sup> described a technique for evaluating interarch space in edentulous patients when the occlusal vertical dimension is established. A denture can be mounted on an articulator using a facebow and occlusal registration and a resilient cast made of polyvinylsiloxane putty. Removing one denture at a time from the cast, an assessment can be made of the distance available from the alveolar ridge mucosa to the antagonist incisal edge. The minimum intermaxillary space for a bar-retained implant overdenture is 10 mm.<sup>19</sup> When low-profile single-

anchor retainers are used rather than a bar, the prosthetic assembly requires 8 to 9 mm. A removable implant complete denture requires 9 to 10 mm. A fixed implant complete denture may need 15 to 17 mm, while a fixed ceramometal implant prosthesis may require only 4 to 8 mm unless angulated abutments are used, which occupy at least 9 mm.<sup>18</sup> When there is insuffi-



**A combination of methods may be necessary to arrive at appropriate facial contours and sufficient interocclusal distance.**

cient space, an alveoloplasty may be indicated, if implant length does not limit the prognosis for success.

### Intermaxillary Relationship

Another benefit of assessing the patient's correct facial height is accurately determining the intermaxillary relationship, which may alter the edentulous implant prosthetic design choice. Davis and colleagues<sup>20</sup> noted that with unfavorable maxillo-mandibular relations it is difficult to reconcile the position of the teeth and the position of the implants with a fixed implant complete denture. For instance, Naert<sup>21</sup> related that on the mandible, a Class III relationship in a fully edentulous patient would best

be restored with an overdenture to increase the occlusal support in the posterior region. In a Class II relationship, an overdenture would allow for more freedom in stabilizing the occlusal scheme, and the mucosa can share in the support when the lateral offset is too great.

### The Flange

The thickness of the buccal flange of an existing maxillary denture may also dictate whether a fixed or removable restoration will be acceptable. Lip and cheek-support needs can be analyzed with either a duplicate denture or ideal wax-up, without the flange. Patients with high smile lines may best be restored on the maxilla with a buccal flange and a removable prosthesis to prevent esthetic problems.<sup>22</sup>

When an implant overdenture is planned, correct border molding<sup>23</sup> is necessary to establish a favorable contour to prevent food entrapment and to provide natural facial tissue scaffolding. The flanges should extend to the vestibule but not intrude on the dynamic movements of the mouth and cheeks. A posterior palatal seal will be required on the maxilla when there is palatal coverage with the prosthesis.

### Midline

The appropriate arrangement of denture teeth in the anterior region is predicated on esthetic, phonetic, and functional considerations. The dental midline when not colinear with the facial midline should be at least parallel to it. Otherwise a visual tension is created.<sup>24</sup> The use of anatomical landmarks on an edentulous cast — bisecting the frenum, nasopalatine foramen, and the midpalatine suture — has been shown in 30 percent of patients to be as much as 5.5 mm off the facial midline.<sup>25</sup> A chairside evalua-

tion is most reliable and will reveal when adjustments need to be made for facial asymmetries. Patients tend to relate the midline to the tubercle of the lip rather than features more distant from the mouth.<sup>26</sup>

### **Selection of the Maxillary Central Incisor**

The selection of anterior teeth when no pre-extraction records are available is still an artistic exercise in harmony and proportion. Biometric measurements have been proposed for the width of the maxillary central incisor, but there is no best single predictor accurate enough for clinical application. The use of the bizygomatic width divided by 16, using the Trubyte Tooth Selector, is not based on sound statistical procedure.<sup>27</sup> Interpupillary distance, interalar width, philtrum width, intercommissural width, and interbuccal frenum distance all lack strong correlation to the maxillary central incisor width.<sup>27,28</sup> It has also been shown that actual measurements of natural anterior dentitions do not follow the golden proportion.<sup>29</sup> The average central incisor width is approximately 9 mm for a white male and less for a female.<sup>30</sup>

### **The Arrangement of Teeth**

The first step in developing an esthetic arrangement of maxillary anterior denture teeth is to determine the incisal edge of the central incisors, which should contact the vermillion border of the lower lip when an /f/ sound is produced. The placement should also provide sufficient lip support. Depending on the lip length, 1-2 mm of the incisal edge should be displayed in repose. Then the exposed incisal part should correspond to half the distance framed between the upper and lower lips during an /e/ sound.<sup>31</sup> The average length of the

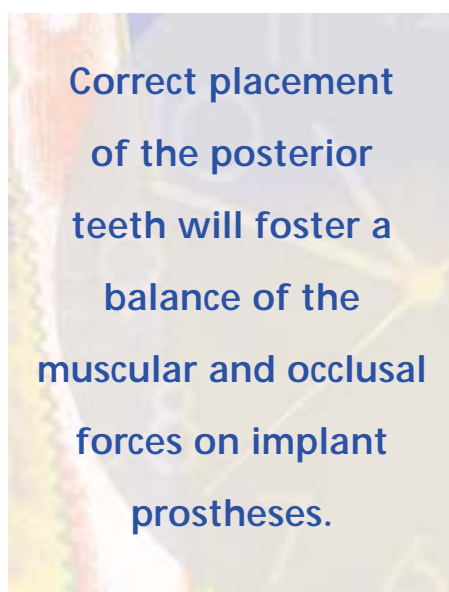


central incisor is 10.5 mm.<sup>32</sup> Frush and Fisher<sup>33</sup> have detailed the esthetic impact of rotating and positioning the anterior teeth. The incisal edges of the maxillary anterior teeth should follow the envelope of the lower lip. A balanced asymmetrical setup with adequate incisal embrasures will provide variety and vitality. Once the maxillary anterior sextant is established, a significant vertical distance between the optimal placement of the artificial teeth and the underlying tissues signals the need for a removable implant design. It is also important to form an adequate palatal convexity in the rugae area for speech competence when there is moderate to severe resorption.<sup>34</sup>

Correct placement of the posterior teeth will foster a balance of the muscular and occlusal forces on implant prostheses. Posterior tooth position can be established by a selection of a neutral zone of the mandibular buccal and lingual tissues or placement of the teeth over the crest of the ridge.<sup>35</sup> The maxillary posterior teeth should then be evaluated in the frontal plane to assess the buccal corridor, which will affect visual perspective. The buccal-lingual positioning of the implants is critical. Implants placed away from the center of the mandibular ridge may cause the prosthesis to encroach on the tongue space or distend the labial or buccal soft tissues. This may lead to ulceration or instability of the prosthesis.<sup>36</sup> The plane of occlusion is a resultant of anatomic landmarks by using the retromolar trigone, lateral border of the tongue, lip commissures, and ridge parallelism.<sup>37,38</sup> In the sagittal plane, it should be parallel to Camper's line and one-quarter inch below Stenson's duct.<sup>39</sup> When the occlusal plane is not appropriately established, esthetics and the occlusal scheme may be compromised.

### Occlusal Schemes

Occlusal schemes recommended for complete arch implant prostheses may be similar to complete dentures. Although non-axial loading has not been shown to be detrimental to the bone-implant interface,<sup>40</sup> prosthetic "lesions" have often been cited as resulting from overload.<sup>41,42</sup> Wie<sup>43</sup> also



found, with both fixed implant complete dentures and implant overdentures, a higher incidence of failing screw joints with mutually protected occlusion as opposed to group function or balanced occlusion. Solnit<sup>44</sup> recommended bilateral balanced occlusion or anterior/posterior group function for complete-arch ceramometal fixed partial dentures. Wismeijer<sup>45</sup> also favored either bilateral balance or group function for mandibular implant overdentures depending on the opposing arch restoration. Arguably, the goal is to develop an absence of deflective contacts in centric closure position and excursions, while developing a free-gliding occlusion during articulation

for equal load distribution and chewing efficiency. Lang<sup>46</sup> has recommended the lingualized concept because of its lack of complexity in execution and minimal reshaping of the cusps. Complete denture occlusal concepts can be helpful in equilibration and remount procedures to refine the scheme.

### Summary

Many of the concepts and procedures for complete denture construction seem integral to implant prosthetic treatment planning and designing. Interim restorative treatment for extensive fixed implant reconstructions may also involve a removable prosthesis. All complete arch implant restorations require an understanding and competence in basic removable prosthodontic principles and procedures. It is ironic that the most recent and revolutionary advance in dentistry appears to be married to one of the earliest treatment regimens. **CDA**

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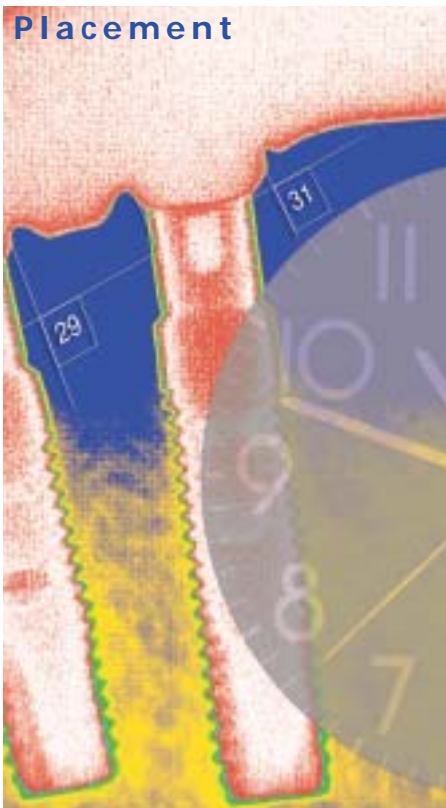
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# When Is an Implant Ready for a Tooth?

Robert G. Tupac, DDS

## Abstract

The capability of placing an osseointegrated implant at the time of tooth extraction and immediately placing a restoration on the implant depends upon a number of factors. This paper describes the traditional Brånemark protocol, the evolution of single-stage surgery, the guidelines for immediate placement, the measurement of implant stability, and the considerations critical to immediately loading.

The patient is a healthy 32-year-old with a fractured maxillary left second premolar. Restoration of the remaining root with crown lengthening, a cast post, and a crown would be the first conservative treatment option. Prudent discussion would include extraction and fabrication of a three-unit fixed partial denture, but the adjacent teeth have no previous restorations and no caries. The dentist further explains the alternative of an osseointegrated implant. What does the patient want to know? "How soon can I have a tooth?" While numerous studies have confirmed the predictability of dental implants for the replacement of a single missing tooth, the answer to the question depends upon many factors.

## Historical Perspective

The original Brånemark protocol<sup>1</sup> calls for a two-stage approach. The implant is placed at the first stage, countersunk to a subcrestal position, and covered with tissue during the osseous healing period. Reasons for using this approach are to minimize the risk of infection, prevent apical down growth of the mucosal epithelium, and minimize the risk of undue early transmucosal loading. A second-stage surgery uncov-

ers the implant and abutment connection, which is required to expose the implant prior to functional loading, the necessary next step toward successful osseointegration.

The traditional method has been so successful that the protocol has been progressively modified. A single-stage surgical approach involves the simultaneous placement of the implant and transmucosal abutment, thereby avoiding the need for a second surgical procedure for the patient and clinician.<sup>2</sup> The outcomes of one-stage and two-stage surgeries were compared in terms of hard- and soft-tissue parameters and were found to be equally successful.<sup>3</sup> Accordingly, studies of early loading (two to four weeks) of implants in the anterior mandible for overdentures<sup>4</sup> and the anterior maxilla<sup>5</sup> were undertaken to determine if, under controlled circumstances (the absence of infection or inflammation, implant placement in bone of sufficient volume and density to achieve initial stability, and elimination of occlusal and especially lateral forces



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during the healing period), equivalent success rates could be achieved. There is now overwhelming evidence that a two-implant overdenture is the first choice for the edentulous mandible. These successes have also resulted in the application of single-stage surgeries in the treatment of posterior partial edentulism.<sup>6</sup> The concept of single-stage surgery becomes critical because dental implant therapy has progressed to include immediate placement and immediate loading procedures. Consequently, dental implant therapy is becoming the new standard of care for tooth replacement.<sup>7</sup>

### Definition of Terms

■ **Delayed placement:** The extraction site is allowed to heal for a minimum of four to six months before the implant is placed. Critical factors for placement are considered in three dimensions:

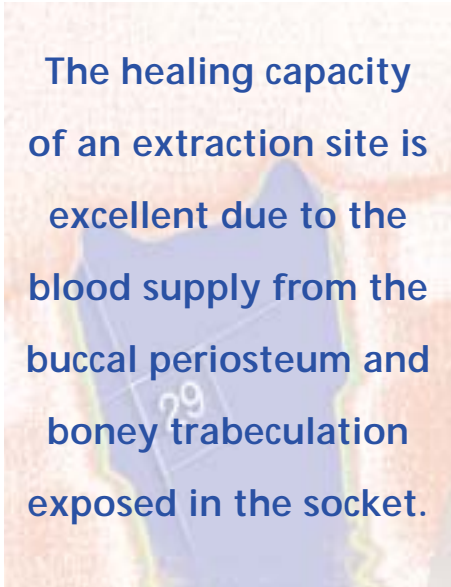
- **Occlusogingivally** — Biologic width elements are the same for implants as for natural teeth, so the mid-buccal crest of bone will be 3 mm from the free gingival margin and 3 mm higher than the interproximal bone.

- **Mesiodistally** — The sides of the implant must be 1.5 mm from the adjacent teeth for healthy biologic width in the horizontal aspect.

- **Faciolingually** — The implant access is to be aimed at the cingulum for anterior teeth, not the incisal edge, or in the middle of the occlusal surface for posterior teeth.

■ **Immediate placement:** The implant is placed directly after tooth extraction. The three-dimensional factors apply. Because the biologic width starts to form immediately, implant placement relative to the buccal crest is important. If initial stability depends upon the cortical plate, submerged placement will result in the erosion of initial stability, and there is the risk of mid-buccal recession.

■ **Initial stability:** A purely mechanical lock created between the threaded, roughened surface of the implant and the proximity and density of its bony housing. Initial stabilization is not the same as osseointegration; it must carry the implant during the critical time of the early stages in the development of osseointegration, during which the implant is at risk. Initial stability is measurable by resonance frequency analysis or torque test values.



The healing capacity  
of an extraction site is  
excellent due to the  
blood supply from the  
buccal periosteum and  
bony trabeculation  
exposed in the socket.

■ **Immediate provisionalization:** The placement of a provisional restoration at the time of implant placement, with special care to create accuracy of abutment fit and emergence profile mimicking that of the removed natural tooth so as to maximize preservation of the interproximal papilla. Usually, the provisional restoration has no occlusal contact, so the term “immediate nonfunctional loading” applies. The permanent restoration is placed two to four months after implant placement, allowing adequate time for osseointegration and soft-tissue maturation.

■ **Immediate loading or immediate occlusal loading:** The placement

of a restoration in occlusal function immediately upon implant placement. Usually this is possible only in Type I or Type II bone.

■ **Provisional loading:** The use of more-interim restorative materials (e.g., acrylic resin) for restoration of implants after stage-two surgery, then, after a time for osseointegration to achieve a steady state, conversion to harder materials, such as porcelain and gold.

### Guidelines for Immediate Placement

The healing capacity of an extraction site is excellent due to the blood supply from the buccal periosteum and bony trabeculation exposed in the socket. Is the patient medically healthy, is the patient behaviorally compliant, and does the patient have good oral hygiene? Is the gingival, periodontal, and periapical status of the adjacent teeth healthy? Is the occlusal relationship favorable and stable? Is the implant site free of apical disorder and inflammation? Is there sufficient intermaxillary space to allow positioning of the implant, abutment, and restoration? Is there sufficient bone volume and density? Is bruxism not an issue?

To be an accepted treatment modality, immediate implantation had to be proven to have comparable short-<sup>8</sup> and long-term<sup>9</sup> survival rates.<sup>10</sup> Immediate placement provides the advantage of preventing post-extraction bone resorption, due to the possibility of ridge resorption during the socket healing phase, and decreases the risk of papilla loss because there is no flap elevation. Clinical and histological studies have demonstrated that non-submerged implants osseointegrate as well as submerged implants and function comparably under load over extended periods.<sup>11</sup> In addition, successful bone regeneration in extraction sockets around immediately placed


implants has been shown to have comparable clinical results to conventional techniques.<sup>12</sup>

### Surgical Technique

Periodontal probing before extraction allows prediction of final soft tissue contours, regarding the 5 mm rule for interproximal papilla height relative to the distance from the contact point of the adjacent tooth and the interproximal bone height,<sup>13</sup> to be included in preoperative informed consent. If the adjacent teeth are to be crowned, there is greater eventual control over the interproximal contact point height and shape. Flat, thick gingival architecture is more predictable than scalloped and thin. How wide is the zone of keratinized tissue? Because the biologic factors influencing the entire process are under less control than with conventional (delayed) techniques, the patient must be made to understand that realistic expectations are limited to what is biologically possible for the existing oral anatomy.

Extraction of the tooth is achieved without flap elevation, with particular attention to preserving the labial (buccal) plate. The lack of visualization of the buccal bone site can be compensated for through preoperative planning and computer tomography scans. Use of periostomes or small diamond points interproximally and palatally (not buccally) can be helpful to establishing a purchase point for leverage. Molars can be hemi- or trisected. After the labial plate has been verified as intact, all remnants of soft tissue are to be removed from the socket. A surgical guide can compensate for the lack of direct vision. The implant is to be aligned ideally, independent of the tooth/root extraction socket. The slope of the palatal wall is used as a drilling guide and for maximum engagement for stability, maintaining drill positioning so that the im-

plant will not exert pressure against the labial bone when inserted. The implant site is to be prepared 3 to 5 mm beyond the apical end of the extraction socket, enabling the use of a 13 or 15 mm length implant. This allows the surgeon to make "2 mm twist drill" treatment planning decisions at the time of surgery. There must be a minimum of 1.5 mm interproximally between the implant and the adjacent tooth. Adjacent implants, placed at the same



Numerous clinical studies have documented successful immediate loading of multiple implants placed in dense bone and splinted with a fixed prosthesis.

time, must be at least 3 mm apart, or there will be a loss of 1 mm height of bone. The gap between the cervical portion of the implant platform and the bone wall, if greater than 1.5 mm, must be covered with a membrane.

### Immediate Loading

Numerous clinical studies have documented successful immediate loading of multiple implants placed in dense bone and splinted with a fixed prosthesis.<sup>14-19</sup> The significance of splinting as a contributing factor to a successful outcome is related to the amount of micromovements at the bone/implant interface (resulting from inadequate initial

stability) during the period of osseointegration. The amount of micromovement that appears to be tolerable is about 100  $\mu$ m for smooth machined surfaces,<sup>20</sup> and slightly higher for rough surfaces. Hence, the need for high initial stability to be able to consider immediate provisionalization, making sure the provisional restoration has no functional contact.

Initial stability is a function of a number of factors. The surgical technique, previously discussed, creates an osteotomy site that allows precision fit of the implant. Bone volume must be sufficient, and density is more favorable if higher (Type I or II). It can be evaluated by drilling torques.<sup>21</sup> For immediate loading, minimum insertion torques of 35-50 Ncm, have been suggested.<sup>22</sup>

The evolution of the immediate placement, immediately provisionalized dental implant as a successful treatment regimen (under optimal circumstances and rigorous guidelines)<sup>23</sup> has created intense interest in its use in the esthetic zone.<sup>24</sup> With the advantage of preserving the tooth structure of adjacent teeth, reducing the spans of restorations, being retrievable, and having long-term documented success, it is often the first treatment of choice.

### Quantitative Evaluation of Implant Stability

When Bränemark introduced osseointegrated implants, the percussion test was used to test osseointegration. The positive sign of initial stability was the high-pitched tone caused by tapping a mirror handle on the fixture mount after the implant had been placed. Radiographic interpretation is a standard two-dimensional method to evaluate the amount of available bone. The Periotest (Seimens, AG, Bensheim, Germany) quantifies the mobility of an implant by measuring the reaction of the peri-implant tissues to a defined impact load, but studies found the re-



Figure 1. The transducer of the Ostell unit is secured to the implant, after the implant is placed.



Figure 2. The Ostell unit.



Figure 3. The implant stability quotient reading from the Ostell unit.

sults to be inconsistent. An osseointegration test was created for titanium screw-type implants, using a surgical handpiece operating in reverse at 20 Ncm in an attempt to remove the implant. If the implant survived this "pass-fail" test, it was ready to be loaded, but the test was not quantitative and was not suitable for longitudinal testing. Today, an electronic method for testing implant stability, called resonance frequency analysis, is available.<sup>25</sup> The method quantitatively and objectively measures stability by the application of microscopic flexural stress. The system consists of an autoclavable transducer that is secured to the implant (Figure 1) or to the abutment, a frequency analyzer, a computer, and proprietary software. After stimulating the transducer, the resonance frequency of the system is recorded (Figure 2). This value measures the degree of rigidity at the bone/implant interface. In the Ostell system (Integration Diagnostics AB, Sævedalen, Sweden), the resonance frequency values are translated into an index known as the implant stability quotient (Figure 3). The implant stability quotient may be measured at the time of implant placement or during the os-

seointegration process as a deciding factor to determine the time of loading (indicating whether an implant should be submerged and undergo a longer period of healing). The Ostell may also be used to evaluate the prognosis of existing implants at the time of prosthesis replacement. Quotient values range from 0 to 100. Almost 10 years of data from the Ostell Users' Group suggest that scores below 50 indicate questionable integration, 50-55 possible to convert to single-stage, 55-60 single-stage, 60-65 possible early load, above 65 immediate provisionalization. It is advisable that the provisional be screw-retained, rather than cemented, not removed during the first two months of healing, and, when possible, splinted (provisionally with resin fibers and composite resin, for example) to the adjacent teeth. The provisional restoration must be out of occlusion.

## Conclusion

With preoperative casts, the patient can have a tooth, by means of a mucoadhesion removable partial, at the time of extraction. Under the best of circumstances, through a series of critical steps, each one dependent on the one before, the patient may be able to have

an implant placed at the time of extraction. The final decision as to whether the implant may be immediately provisionalized can be made when the initial stability of the implant is determined after placement.

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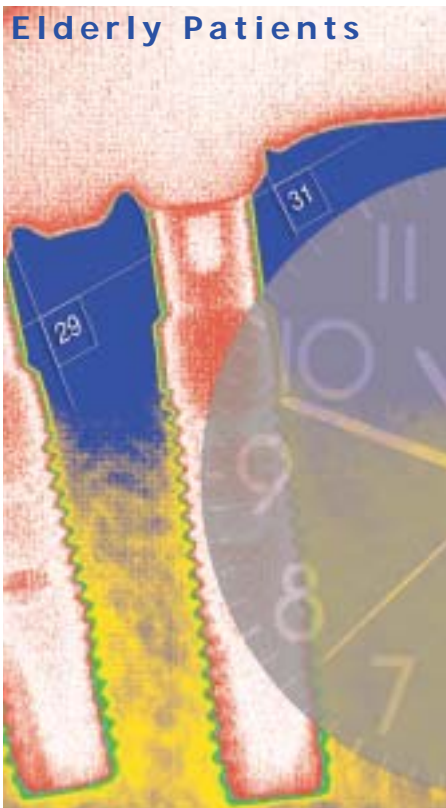
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# Immediate-Loading Dental Endosteal Implants and the Elderly Patient

Frank M.A. Vidjak, DDS, MEd, and Margarita Zeichner-David, PhD

## Abstract

The concept of immediately loading dental implants has the potential of being a viable addition to treatment modalities. The major decision-making challenge in managing depleted dentitions and complete edentulism in an aging society lies in differentiating the treatment outcomes, especially patient-mediated assessments (including economic analyses) of the various prosthodontic options available for older adults. The ability to chew properly is of great importance to maintain a healthy nutrition and improve oral comfort and quality of life, particularly in the elderly years.

The scope of treatments offered to patients has significantly broadened in the past few decades. Treatment plans, which once were focused solely on the presence or absence of natural dentition, were limited to traditional fixed and/or removable prosthodontics. Few developments in the clinical practice of dentistry have had such a great impact as the development of the endosteal dental implants, and Brånemark deservedly receives most of the credit for providing this type of treatment protocol.

The group of individuals with the highest propensity for compromised function, comfort, and self-esteem are edentulous patients.<sup>1,2</sup> Given the nature of the mandibular arch anatomy, this area is often the source of many post-treatment complications. It is well-known that jaw bones tend to resorb when teeth are lost. Many factors have been proposed as being responsible for the individual variations in post-extraction bone remodeling. Some of them are systemic (smoking, diseases, osteoporosis, etc.); however, since severe residual ridge resorption may occur even when the bone is in good condition, there must be local functional fac-

tors that determine which individuals experience more or less pronounced bone loss.<sup>3</sup> Bone resorption represents a particularly serious problem for elderly patients since many of them have to wear complete dentures, which results in a compromised chewing function.

The number and percentage of older adults has increased dramatically during the past century, and about 9 million of the older adults in the United States are edentulous.<sup>4</sup> Tooth loss can be severely disabling, and it has a profound impact on the quality of life of elderly people.<sup>5</sup> In addition to the esthetic and self-esteem issues associated with edentulism that can lead to isolation and depression, there is an association between masticatory efficiency and limited food choices that has long been established. An al-



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tered food choice as a consequence of reduced masticatory efficiency could result in malnutrition and might be a risk factor for systemic disease thereby placing individuals at increased risk of life-threatening conditions, such as atherosclerosis and cancer.<sup>6-7</sup>

A significant amount of information focusing on creating treatment modalities to improve the quality of life of the edentulous patient has been published. Since more people are living longer, the edentulous aging patient represents a challenge for dentists trying to restore esthetics and function to increase quality of life. When placing endosteal implants, it is important to understand the process of bone remodeling and the factors that can affect the integration of osseous dental implants. Approximately 0.7 percent of a human skeleton is resorbed daily and replaced by new healthy bone. With aging and metabolic disease states, the normal turnover process may be reduced and could affect the placement and integration of implants.<sup>8</sup> Osseointegration involves an osseous healing response that may be compromised by aging given that the patient's healing process itself could be compromised. However, several recent studies have documented the comparison of implants in older (65-91 years) and younger (41-60 years) adults, finding no difference in the success rate of osseointegration.<sup>9-13</sup> These studies indicate that age should not be a determinant in excluding edentulous patients from being treated with diverse prosthodontic procedures, including implants.

The original protocol described by Brånemark and colleagues<sup>14-15</sup> requires two stages — first, surgical placement of the implant fixture; second, surgical uncovering of implant fixture — with a



Figures 1a and b. Pretreatment, January 2000.



Figures 2a and b. Pretreatment radiographs, January 2000.



Figure 3. Maxillary complete denture and mandibular immediate complete denture at time of placement.



Figure 4. Mandibular anterior ridge six weeks post-extraction.

healing period of approximately three months between surgeries. The healing period provides a time of nonfunction to ensure that osseointegration of the implants occurs. Many authors have published studies that validated the

use of this protocol, which, in turn, has led to its wide acceptance by the dental profession.<sup>16-22</sup>

Though clinically successful, certain aspects of the protocol have come under scrutiny due to lack of





Figure 5. Surgical guide in place during implant surgery.



Figure 6. All implant sites prepared.



Figure 7. All implants have been placed and 20 degree Astra Uniabutments connected.



Figure 8. Entaglio surface of mandibular complete denture prior to placement of silicone pressure-indicating material.



Figure 9. Mandibular complete denture with silicone pressure-indicating material placed over implant abutments.



Figure 10. Openings made in mandibular complete denture where implant abutment location evident.

scientific evidence to support them. One of the issues being reviewed in recent years has been the need for a healing period following implant placement. Many studies describe a one-stage surgical protocol followed

by the immediate utilization of the implants, particularly when treating the anterior mandible.<sup>23-29</sup> The reported success shows a trend that could be comparable to the two-stage protocol. The advantages of immedi-

ately loading implants are that it allows for immediate improvement in the patient's functional ability and self-confidence while dramatically reducing treatment time. Proper clinical assessment of bone density and implant stability becomes even more important when implants are immediately loaded since the usual period of healing (nonfunction) has been eliminated. In the present study, the authors report the case of an edentulous elderly patient who received an immediately loaded mandibular fixed implant-supported complete denture, formerly referred to as a hybrid prosthesis, thus eliminating all previous taboos concerning immediate loading of implants and the elderly patient.

Contrary to most of the studies involving immediate implant loading, the intent of this treatment plan was to place the minimum number of implants with maximum anterior-posterior distribution. Minimizing the number of implants reduces the surgical and prosthetic complexity, as well as the overall cost. Maximizing the anterior-posterior distribution allows for minimal impact on the final prosthesis should a failure of osseointegration occur.

### Case Presentation

A 79-year-old Caucasian female came to the office with a complaint of mandibular pain. Clinical and radiographic examination revealed unstable maxillary and mandibular removable partial dentures and unrestorable infection-prone mandibular dentition (**Figures 1a and b and 2a and b**). Following a thorough conversation with the patient about her treatment options, a decision was made to remove



Figure 11a. Openings enlarged to avoid binding of Astra metal provisional copings on the denture base.



Figure 11b. Undercut areas blocked-out with reversible hydrocolloid (VanR Corp., Oxnard, Calif.)



Figure 11c. Long lab screws retaining metal provisional cylinders while autopolymerizing polymethylmethacrylate powder and liquid is placed by brush.

all the remaining dentition and follow with placement of new maxillary and mandibular dentures (**Figure 3**). The patient returned a few months later with a somewhat compromised masticatory function due to mobility of the mandibular denture. A dental CT scan was performed. Since the patient was in good health, was a nonsmoker, and had good bone density, it was decided to replace the mandibular removable prosthesis with a fixed implant-supported prosthesis (**Figure 4**). Due to lack of clinical and radiographic signs of combination syndrome and the patient's satisfaction with a conventional complete denture, no implants were scheduled to be placed in the maxilla.

Seven Astra implants (Astra Tech, Inc., Lexington, Mass.) were placed (one 4.5 mm x 8 mm ST, five 4 mm x 13 mm, one 4 mm x 10 mm). Due to the proximity of the inferior alveolar nerve in the No. 29 position, a 4.5 mm x 8 mm implant was placed (**Figures 5 and 6**). The 20 degree Uniabutments were attached to all the implants except for the implant placed in the mid-symphysis area (**Figure 7**). There was no apparent strategic value in utilizing the implant at this time. During the surgery,



Figure 12a. All metal provisional copings have been attached with PMMA resin. The mandibular complete denture was recontoured to facilitate access for cleaning.



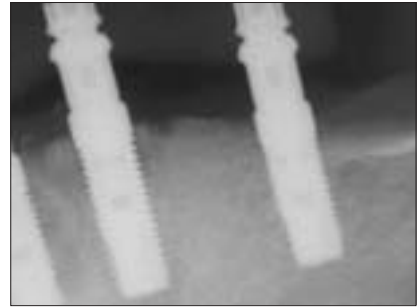
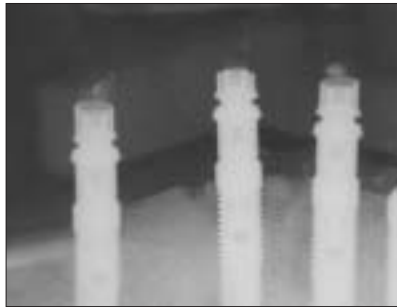
Figure 12b. Final placement of provisional fixed implant-supported complete denture.

the surgeon felt that the bone density and implant stability were favorable to immediately load the implants.

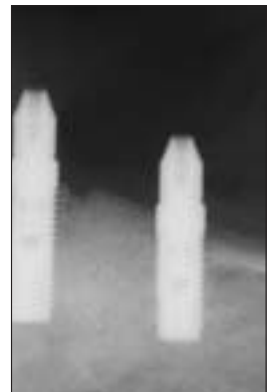
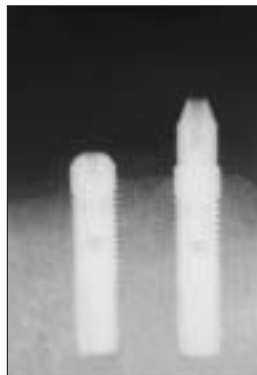
The process of creating a provisional mandibular fixed implant-supported complete denture began with the use of a silicone pressure-indicating material (Fit-Checker, GC America) in the entaglio surface of the mandibular complete denture (**Figures 8 and 9**). Openings were made so that the six Astra metal provisional cylinders could be placed without binding on the denture (**Figure 10**). The provisional cylinders were connected to the denture with autopolymerizing resin (Laboratory Repair Resin, Dentsply Corp.) (**Figures 11a, b, and c**). The denture was re-

moved and recontoured to allow access for cleaning. The provisional restoration was screwed into place and the screw access openings sealed (**Figures 12a and b**). Baseline radiographs were made (**Figures 13a, b, and c**).

One week after the surgery, the patient unexpectedly announced that she had to leave the country. Following her return three months later, clinical and radiographic exams were completed. At this time, it was determined that the implant in the No. 29 position had failed (**Figures 14 and 15**). This implant was removed. The provisional restoration was modified accordingly (**Figure 16**). The loss of this implant had no impact on the progression of treatment



Figures 13a, b, and c. Radiographs, March 2000, the day of implant and prosthesis placement.



Figures 14a through e. Radiographs, June 2000, with provisional fixed implant-supported complete denture removed.

due the favorable anterior-posterior distribution of the remaining implants. A soft-tissue impression with light-bodied polyvinylsiloxane impression material (Extrude, Sybron/Kerr Corp.) was made using the provisional restoration. This allowed for the registration of the soft tissues, centric relation position, and the vertical dimension of occlusion in one step (**Figures 17 a, b, and c**). An impression of the maxillary denture was made for the working cast. The casts were mounted, and the process of fabrication of the final restoration began.

To eliminate the presence of a majority of occlusal access openings, two gold substructure bars each with one



Figure 15. June 2000, the provisional prosthesis removed and the condition of implants evaluated. The implant in the No. 29 position was found to be mobile.



Figure 16. Provisional prosthesis with failed implant provisional cylinder removed and area re-contoured.





Figure 17a. Tissue impression in place.



Figure 17b. Entaglio surface of tissue impression using the provisional restoration as a tray.



Figure 17c. Provisional restoration and tissue impression on working cast. Soft tissue contours and the vertical dimension of occlusion registered at the same time.



Figure 18. Implant-supported tissue bars in place. Each has a threaded site for a lateral set-screw.



Figure 19. Silicone putty matrix in place to verify presence of adequate space for metal superstructure, PMMA resin, and denture teeth.



Figure 20. A wax and acrylic resin replica of the provisional prosthesis was utilized to verify the vertical dimension of occlusion.



Figure 21. The superstructure was cast, indexed, and soldered.



Figure 22. Labial view of final restoration. Space for cleaning access that was determined during the provisional phase of treatment was duplicated in the final restoration.



Figure 23. Occlusal view of final restoration. Note single direct implant connection lingual to No. 22. All other access openings have been eliminated by underlying tissue bars.

lateral set screw were fabricated. One opening would remain in the No. 22 position (**Figure 18**). A silicone core (Reprosil Putty, Coe, Inc.) made of the entire provisional prosthesis was utilized to evaluate clearances required for the restorative materials and compo-

nents (**Figure 19**). A wax and acrylic resin replica of the provisional prosthesis was utilized to verify the vertical dimension of occlusion (**Figure 20**). This replica was cut back to the desired form of the superstructure. The superstructure was cast, indexed, and soldered

(**Figure 21**). A final clinical and radiographic evaluation for passivity of fit of the framework was completed. At this point, no further clinical evaluations were made. The final restoration was completed and the prosthesis delivered (**Figures 22 through 25**).



Figure 24. Entaglio view showing receptacle sites for tissue bars and direct connection to implant in No. 22 position. Openings for lateral set-screws can be seen lingual to the tissue bar areas.



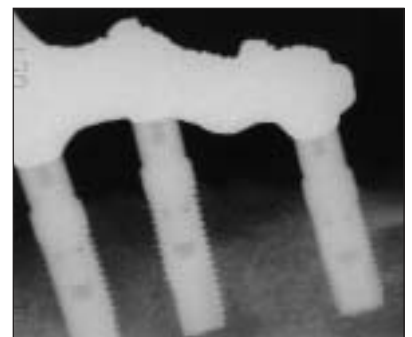
Figure 25. Labial view of maxillary and mandibular prostheses on day of final placement.



Figure 26. Smile with final prostheses in place.



Figure 27. Frontal view with final prostheses in place.



Figures 28a-d. Radiographs December 2002 — Note minimal crestal bone height change since time of implant placement.

It has been almost three years after the treatment, and the patient has maintained an excellent level of oral hygiene, had no complications, and had an extremely high satisfaction level (Figures 26 and 27). Radiographically, the bone levels ap-

pear to be stable (Figures 28a through d). The anterior maxilla continues to show no clinical signs of combination syndrome. Although the patient lives out of the country, she has been returning for recall exams once or twice a year.

### Closing Remarks

There is no doubt that the way in which dentists utilize dental implants is evolving at an astounding rate. The intimate relationship between living oral tissue and artificial dental implant material is influenced by several factors,

such as biocompatibility and/or biotoxicity of the implant material, differential elasticity of the materials and tissues, implant design, primary implant stability, the manner by which the tissues attach to the material surface, topography of the material surface, presence of micromovement, and implant-abutment joint design.<sup>30</sup> All of these factors, in addition to the age and overall systemic health of the patient, will determine the clinical success of the implants.

The concept of immediately loading dental implants has the potential for being a viable addition to treatment modalities. Scientific evidence derived from animal studies using beagle dogs indicates that the micromotion at the implant-bone interface does not interfere with the osteogenesis and new bone growth at the implant-bone interface.<sup>31</sup> It appears that the increased function causes a load-related bone formation that minimizes the physiologic age-related mandibular bone mass density and that this effect seems to be independent of the attachment system.<sup>25</sup>

The major decision-making challenge in managing depleted dentitions and complete edentulism in an aging society now lies in differentiating the treatment outcomes, especially patient-mediated assessments (including economic analyses) of the various prosthodontic options available for older adults.<sup>32</sup> However, at this time, clinical judgment plays an even more critical role due to subjective nature of the decision-making process when immediately loaded implants are concerned. Who is the anatomically, physiologically, and psychologically appropriate individual to be treated in this manner? Many issues remain unanswered. However, the ability to chew properly is of great im-

portance to maintain a healthy nutrition and improve oral comfort and quality of life. Continued research in this area will be critical to bring this part of the treatment planning process into the evidence-based arena. **CDA**

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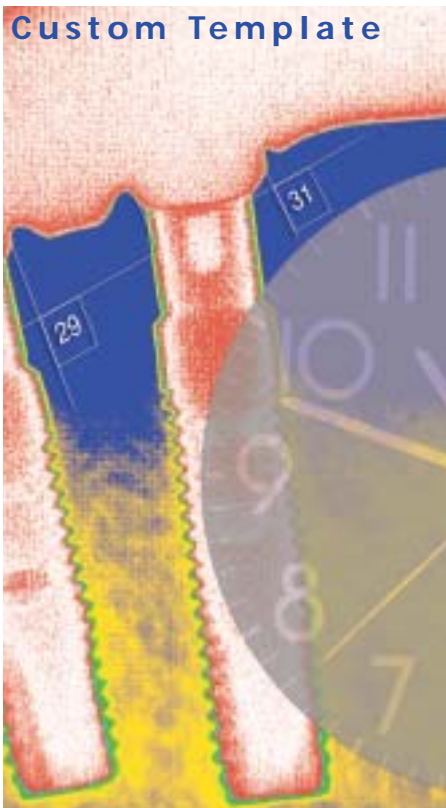
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# The Use of a Custom Template for Immediate Loading With the Definitive Prosthesis: A Clinical Report

Christopher B. Marchack, DDS, and Peter K. Moy, DMD

## Abstract

A new approach to implant dentistry for the fully edentulous arch is presented. Using a conventional computer tomography scan and specialized surgical planning software, a fixed final prosthesis is fabricated before the surgical procedure so the prosthesis may be delivered immediately after the implants are placed. Initial prospective studies of 10 patients with observation times of up to 24 months have shown all patients to have a functional prostheses. Long-term studies are being performed to validate this new procedure.

The development of dental implants has had a major impact on edentulous patients. For some, a nonremovable fixed complete denture can replace a complete denture. Treatment with a nonremovable fixed complete denture is typically initiated in a patient who is edentulous in at least one arch. A complete denture wax-up is fabricated to establish the setup of denture teeth for esthetics, phonetics, and vertical dimension of occlusion. Then a radiographic template is fabricated by duplicating the wax denture; and a preoperative panoramic radiograph is taken for initial evaluation, followed by additional radiographs, such as a computer tomography scan, to verify the volume of bone and identify vital structures. For the traditional technique described by P.I. Brånemark, five or six dental implants are placed.<sup>1</sup> The protocol calls for the patient to refrain from wearing any prosthesis over the surgical site for the first two weeks. After the initial healing period, the patient can resume wearing a denture prosthesis with a soft liner in place. The typical healing time is approximately four months for the mandible and six months for the maxilla.

After osseointegration of the dental implants, a second surgery exposes the

dental implants through the gingival tissues; and the existing denture is retrofitted, with a soft liner, over the implant abutments. The tissue is allowed to heal for six to eight weeks.<sup>2</sup> The appropriate final abutments are placed, and the prosthetic phase of treatment may begin. The average time to complete treatment is one year.

With the many technological advancements occurring with implant surfaces,<sup>3-5</sup> CT scanning techniques,<sup>6,7</sup> computer assisted treatment planning programs,<sup>6,8,9</sup> the fabrication of stereolithography casts,<sup>6,8</sup> and restorative techniques, a new treatment modality has been developed for immediate loading of dental implants with a prefabricated definitive restorative prosthesis.<sup>6,12</sup> This paper will describe a new technique of treating patients by using a custom surgical template to provide accurate placement and positioning of the dental implants for immediate



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Figure 1. The radiographic markers are used as reference points to superimpose the two images.



Figure 2. The interocclusal record orients the patient in the centric relation position during the CT scan.

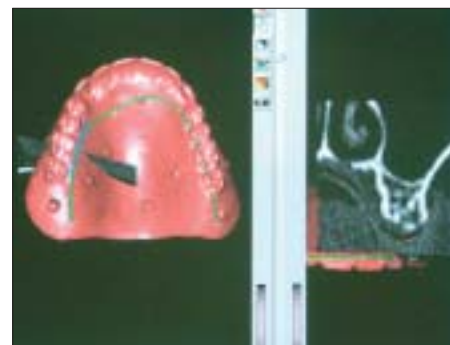


Figure 3. The Oralim software allows for 3-D views for implant planning.

loading with the definitive prosthesis (Teeth in an Hour, Nobel Biocare, Yorba Linda, Calif.).

### Materials and Methods

Treatment starts with the selection of a patient who is edentulous in one or both arches. The fabrication of an ideal denture is necessary to define tooth position and placement for esthetics,<sup>14</sup> speech,<sup>15</sup> and occlusal vertical dimension.<sup>16</sup> After adequate bone volume is established through a panoramic X-ray, the patient is sent for a double-scan-technique CT scan.<sup>6</sup> The two-scan technique allows scanning of different objects at different densities: the patient's jaw and the acrylic denture or replica of the denture. Thus, the CT data may reformat the edentulous arch and the removable prosthesis in relation to that arch separately. The two CT scans are then superimposed onto each other.

The reformatted images, created with a special software package for the CT scanner, are then returned to the dental team for the planning session to determine the number of implants, implant positions, and angulation. A three-dimensional, implant planning software program (Oralim, Medicim, Leuven, Brussels) allows the clinician to evaluate the osseous tissues in relationship to the position of the denture teeth. From this information, the posi-

tions and sizes of the dental implants may be digitally placed and evaluated in three dimensions with the surrounding structures. The planning is guided by bone quality and quantity, as well as the position of the teeth for esthetics and phonetics.

After the surgical treatment is designed, a stereolithography cast (a CAD/CAM epoxy resin cast) is fabricated for the dental arch. The positions of the planned dental implant sites and the denture prosthesis are also integrated into the milled cast. This CAD/CAM cast is reproduced with great precision and can be mounted onto an articulator with interocclusal records made of the patient and the opposing arch. With such accuracy transformed to the cast and its mounting, all dimensions of the patient's dental arch and prosthesis are replicated prior to implant placement.

Implant replicas are then placed into the predetermined implant sites, and a surgical template is fabricated. The surgical template will provide for a precise positioning of the dental implants, which will guide the surgeon during placement.<sup>17</sup> An interocclusal record is made between the surgical template and the opposing arch, to transfer the centric relation and vertical dimension information to the mounted casts and to position the surgical template to the patient's jaw during

surgery. Maintaining the accurate position of the surgical template during the surgical procedure is accomplished by the use of horizontal stabilization pins, which are integrated into the template and stabilized in the osseous tissues.

The accuracy of the surgical template from the stereolithography cast duplicates the exact implant position on the patient. With the exact transfer of implant positions, the definitive prosthesis is fabricated prior to implant placement. The prosthesis is fabricated at the correct centric relation and vertical dimension position. The initial denture prosthesis will dictate the position of the denture teeth for esthetics and phonetics. The prosthesis can be fabricated by traditional means with a gold casting, milled titanium, or a new carbon fiber material.<sup>18-20</sup> The denture teeth are then attached to the framework.

The surgery is a flapless procedure performed with local anesthetic.<sup>12,13</sup> The surgical template is inserted with the interocclusal record to guide the surgeon in the proper seating of the template. The patient is assisted in closing into the interocclusal record in the centric relation position. While the patient is closed into the interocclusal record, the horizontal stabilization pins are placed



Figure 4a. The stereolithography cast is mounted on the articulator.



Figure 4b. The surgical template is fabricated and an interocclusal record is made between the surgical template and the opposing arch.

into the osseous ridge to hold the surgical template securely in position. The patient is asked to open, and the first implant is placed in the second-to-most posterior position. After the first implant is placed, a template abutment — which is a specially designed abutment providing additional stabilization of the surgical template to the dental implant — is inserted. The template abutment holds the position of the surgical template to the position of the first implant. A second implant is then placed in the second-to-most distal implant position on the contralateral side of the arch, and a second template abutment is attached to this implant.

The surgical template retained by three horizontal stabilization pins and two template abutments, ensures the stability and accurate position of the template. The remaining implants can be placed sequentially. Once all the implants are placed, the definitive prosthesis is inserted. If necessary, the occlusion can be adjusted after insertion of the prosthesis.

### Clinical Report

A 60-year-old woman presented with a maxillary complete denture and a mandibular fixed metal-ceramic re-

construction. The patient had been edentulous in the maxilla for more than four years because she was never comfortable with a maxillary prosthesis. The oral surgeon and prosthodontist gave the patient a comprehensive examination to confirm the possibility of implant therapy with immediate loading of the dental implants.

### Procedure

1. A new maxillary complete denture was fabricated to determine and confirm tooth position for esthetics, phonetics, and the vertical dimension of occlusion.

2. Six to eight radiopaque markers were placed into the denture. Three 2 mm holes were placed into the buccal surface of each side of the denture and two holes were placed to the lingual of the maxillary central incisors. The holes were filled with gutta-percha, which would then function as radiopaque markers (Figure 1).

3. An interocclusal record was made with a rigid polyvinyl siloxane material at the patient's appropriate centric relation and occlusal vertical dimension (Figure 2).

4. The patient was given a maxillary CT scan. The first scan was of the patient

with the denture, which had fiducials and the interocclusal record. The second scan was of the denture only, which was positioned in the CT scanner in a similar orientation as in the patient's mouth.

5. The CT data was formatted to have the two sets of scans superimposed upon each other. One scan was of the osseous tissues; and the other was of the complete denture, which showed the position of the planned denture teeth. The reformatted data was returned to the surgical and restorative team to determine and plan for the implant positions. Planning for implant placement was completed with the Oralim software program. The data was transferred to a dental laboratory with special milling devices (Procera, Nobel Biocare, Yorba Linda, Calif.) to fabricate the stereolithography cast. The stereolithography cast would then have the preplanned osteotomy sites of the dental implants. In these sites, implant replicas could be placed, providing the exact positions of the implants (Figure 3).

6. The stereolithography cast was returned to the dental laboratory and was mounted, on the articulator, to the opposing cast with the original interocclusal record. A surgical template and a screw-retained implant denture were fabricated to the position of the implant replicas. A new interocclusal record was fabricated to index the surgical template and the opposing arch (Figure 4a, b).

7. The surgical procedure was started under local anesthesia. The surgical template was inserted and positioned with the interocclusal record in centric relation position. The initial surgical step was the placement of the stabilization pins, in three preplanned horizontal positions. A 1.7 mm twist drill was used creating retentive holes for the stabilization pins. After the pins were





Figure 5. The surgical template is held into position with the horizontal stabilization pins.



Figure 6. The first implant is placed, and a template abutment is inserted to hold the position of the surgical template.



Figure 7. The adjustable abutment allows for the variation in the Z-axis with the implant placement.



Figure 8. The initial closure of the patient, after implant surgery and the prosthesis inserted.



Figure 9. Postoperative periapical radiographs taken after implant surgery.

positioned into place and the surgical template secured, the patient was allowed to open (**Figure 5**).

8. The first osteotomy site was prepared, one before the most distal implant site, using the appropriate drilling guides and twist drills. The preplanned length and diameter of implant was placed using the implant guide. After insertion of the implant, a template abutment was inserted to provide additional stability of the surgical template (**Figure 6**).

9. The next implant was inserted in the opposite side of the arch, one before the most distal implant. After the implant was placed, a second template abutment was inserted, providing for an extremely stable surgical template.

10. The remaining implants were placed, using the same drilling guides and twist drills.

11. After all the implants were placed, the definitive prosthesis was inserted using an adjustable abutment that allowed for discrepancies in the Z-axis (**Figure 7**). The adjustable abut-

ment is an interlocked, two-piece sleeve that slides within the two cylinders. The interconnected sleeve allows for the Z-axis variable in the implant position. Once the prosthesis was seated, the retaining screws were torqued to place, and the occlusion checked and adjusted as necessary (**Figure 8**). Postoperative radiographs were taken to confirm the seat of the prosthesis (**Figure 9**).

## Summary

A new approach to implant dentistry has been presented for the edentulous arch. Using a conventional CT scan and specialized surgical planning software, which produces an accurate stereolithography cast, a fixed final prosthesis is fabricated before the actual surgical procedure so that the prosthesis may be delivered immediately after the implants are placed. Another immediate load system, the Novum System (Nobel Biocare, Yorba Linda, Calif.), requires the prosthesis to be fabricated over a premilled framework

after the implants have been placed. The benefits of this new procedure to patients are:

- Shorter surgery times;
- Shorter treatment times;
- Less invasive, flapless surgery and therefore less chance of swelling, less pain, and faster initial healing times;
- A prefabricated definitive prosthesis; and
- Use of the fixed prosthesis immediately.

This is a short list of potential benefits to patients. However, this treatment option is new and under investigation. Traditional two-stage techniques are predictable, having cumulative success rates of 99 percent in 15-year studies.<sup>21</sup> Initial prospective studies of this new option of 10 patients with observation times of up to 24 months have shown all patients with functional prostheses.<sup>6</sup> Long-term studies are being performed to validate this new procedure. **CDA**

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# Privacy Act leads to Paper Sacks

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Within 48 hours, everybody in town knew of Shania Schwartz' oral falsies.

e've been looking the Health Insurance Portability and Accountability Act over very carefully. We took an impromptu survey of our patients to ascertain their interest and understanding of the issues involved. The mandatory dozen pages of fine print explaining exactly what those issues are were initially met with wooden incomprehension. The Legalese-to-English Conversion pamphlet's explanation proved to be invaluable, however, giving the evening office cleanup crew something useful to do.

I know we are not alone in our appreciation of a beneficent government that devotes so much time and money dedicated to furthering our best interests. The typical response from patients has been an enthusiastic, "Huh?"

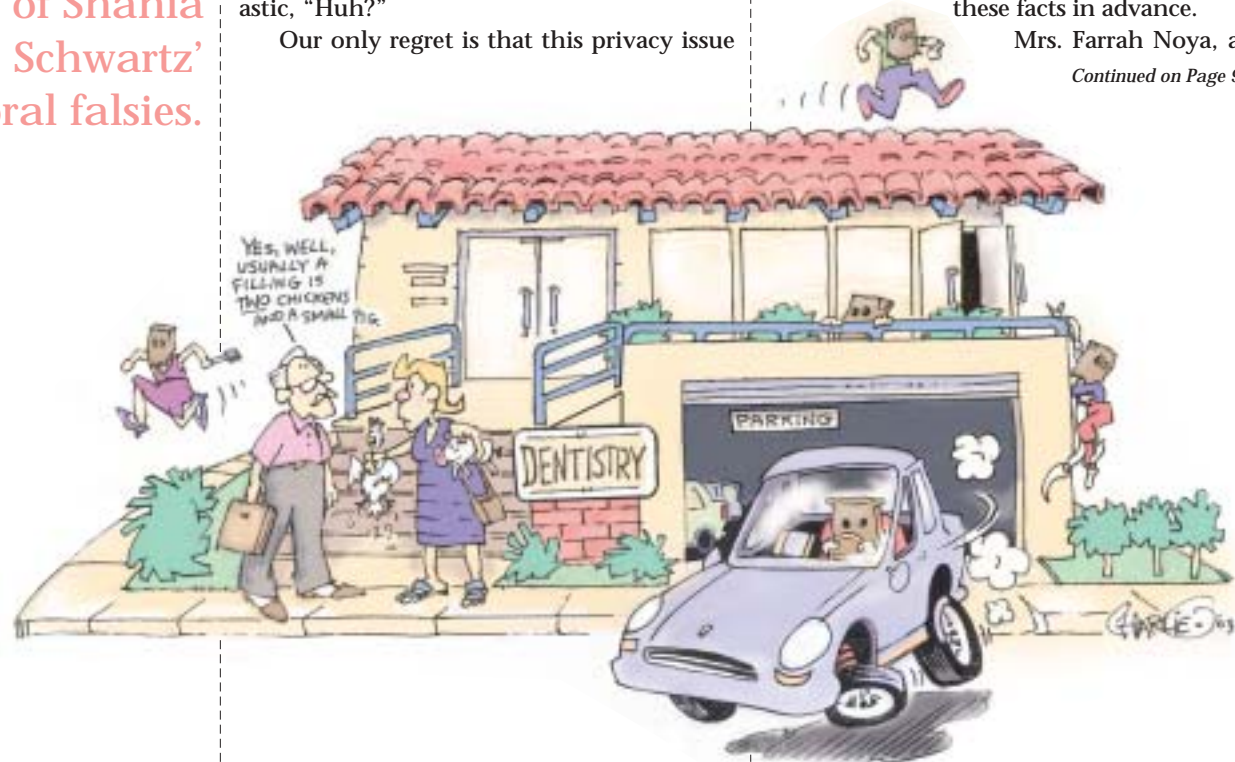
Our only regret is that this privacy issue

took so long to be addressed. Years ago, two patients genetically programmed to hate each other on sight, met quite by accident in our reception room. When this encounter left the area frigid enough in which to hang meat, we realized privacy had become our top priority next to departing the premises at 5 p.m.

An ensuing incident clinched our decision. It had been our custom over the years to tape a day sheet to the operatory wall indicating who was scheduled and what the appointment was for. Not liking surprises, this precluded demanding the seated patient to state clearly who she was and what she wanted, a request that annoyed some people who unreasonably felt we should have known these facts in advance.

Mrs. Farrah Noya, age

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47, height 5 feet 6½ inches, weight 149, chemically processed hair and with other possible surgical enhancements, noticed the day sheet upon dismissal. At 10:45 a.m., according to the sheet, a certain Shania Schwartz, divorcee, age 39 (unconfirmed), height 5 feet 4.5 inches, weight 124 (also unconfirmed), 36-26-48 (ha!), usually encased in a Kmart knockoff frock and Revlon's entire line of cosmetics, was due to have a lower cast partial seated.

In what we now acknowledge as a blatant breach of privacy, the day sheet plainly stated: 10:45, Schwartz, Shania, seat PLD. Espying this, Mrs. Noya blanched, clutched her bosom as if in cardiac arrest and visibly shaken, fled the office without pausing at the front desk for her free sample of Listerine's FreshBurst PocketPak.

Within 48 hours, everybody in town knew of Shania Schwartz' oral falsies, the grapevine extending as far away as Nebraska. As a result, the following transpired:

1. Ms. Schwartz, privacy compromised beyond salvation, left town hurriedly, leaving no forwarding address. Her family believes she was headed for McMurdo Station, Antarctica, because she took her mukluks and a change of Victoria's Secret thermal briefs with her.

2. Our office, fearing litigation of

monumental proportions, immediately implemented comprehensive privacy strictures. The Schwartz records were expunged from our files; her new partial was destroyed, observing meticulously all EPA, OSHA, FBI and HIPAA rules involving disposal of prosthetic appliances, metal/acrylic, vol. 9, sect. 4 application 32 between 0345 and 1610 Zulu.

Noting the successful application of the government's Witness Protection Program, we now have a Patient Protection Program implemented.

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Patients upon dismissal are issued a paper sack with eyeholes to wear while they descend to the parking lot via a fire pole installed adjacent to the chair. They are instructed not to return home for 48 hours and then by a circuitous route, speaking to no one in transit.

Our staff now speaks only in whispers using a code devised by

Navaho Indians. The day sheet looks like this:

XXXX a.m., XXXX, Mr. XXXX

Electronic submission of claims, which held so much promise initially but evolved into a veritable blabbermouth of privacy invasions, has gone by the board.

We are presently using a barter system, negotiating our services for usable items like quilts, costume jewelry, and the occasional chicken or small pig.

NOTE: All of the above is to be held in the strictest confidence and should you reveal the contents thereof, you will be terminated (HIPAA, p. 93, vol. 7, line 16).

**CDA**