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Communication in Esthetic Dentistry

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DEPARTMENTS

FEATURES

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Vital Bleaching: A Vanishing Revenue Center?

Jack F. Conley, DDS

We have noticed with interest an evolution in general practice in the past decade as current generations of patients – benefiting from preventive instruction and techniques and improved dental hygiene – have been much less dependent upon restorative dentistry than their predecessors. In turn, this has caused many general practices that formerly had a traditional preventive and restorative approach to add practice management-developed concepts such as soft-tissue management and cosmetic dentistry. One or both of these philosophies will continue to be central to the success of the general practice well into the future.

However, one aspect of the cosmetic practice is likely to change. We refer specifically to tooth whitening, which has become very popular in recent years. When bleaching techniques first surfaced, many practitioners approached their possibilities very conservatively, being concerned about possible short- or long-term dangers to hard and soft tissues. In the early days, most of the bleaching systems developed were based upon dentist control, whether in the office or in kits designed for home use. Franchise practice centers devoted entirely to tooth whitening and over-the-counter systems available directly to the public soon entered the marketplace.

The importance to general practice cannot be diminished, as tooth whitening developed a new revenue center that had impact for two reasons. First, much like the initial dental "insurance" benefit plans in the 1960s, whitening brought new patients into the office who might not have had other incentives to come. In addition to cosmetic "wants," they brought with them other oral health needs to be treated.

The second reason tooth whitening was important to general dentistry was that its revenue replaced the losses in restorative revenue that some practices had been experiencing due to the preventive gains in oral health care. However, there have been people both inside and outside of the profession who have been critical of this trend. Media critics and some within the profession have tended to look at tooth whitening as an activity that seems to lessen the image of a dentist as an oral health care professional.

The "looking good" phenomenon prevalent in society today has continued to help the concept of bleaching to flourish, as have the continued improvement in materials and techniques. Information market through the mail and the scientific shows bring continuing evidence that the technology is rapidly becoming more sophisticated. The formulas and equipment being introduced are making the bleaching process much quicker and the shade reductions more impressive; while, at the same time, the competition for adoption of the new systems seems to be dropping the unit or per-patient cost to the practitioner. It seems like a win-win for all, or does it?

We can't forget the other major player in this scenario, the dental products divisions of the consumer giants that have been in the direct-to-patient marketplace for some time with whitening strips and paint-on bleaching materials. They have been bringing the whitening craze to the average citizen in a form that is easy to access, easy to use, and, in most cases, far less costly than the techniques the dentist is able to offer. The major differences with over-the-counter products seem to be the time and continuous commitment of the user to obtain reductions in shades. Another downside is the loss of the practitioner's expertise and guidance on shade management.

According to one dentist expert in the field who has done valid clinical research, one of the materials and its technique marketed over the counter takes approximately two weeks to achieve the same shade lightening as might be accomplished by laser technology in the dental office in an hour or two. The individual without limitations on disposable income might continue to maintain the desired shade appearance through visits to the office. But what about those who either because of cost, convenience, or reluctance (out of fear) do not want to go to the dental office in the future? A recent television magazine feature specifically referenced that group of people in society who, while interested in whiter teeth, would not want to visit a dental office due to fear. The feature suggested that an office visit was no longer necessary because whitening can be achieved with over-the-counter products.

What if those previously treated in the office believe they can maintain their desired shade through periodic self-application of over-the-counter materials? It seems that in the future, the general practice revenue from this cosmetic procedure will diminish if a significant number of individuals who previously received one of the in-office bleaching techniques decide to maintain their appearance via over-the-counter kits and new patients wanting tooth whitening do not come forward to replace them.

As dentistry moves toward the future, it is likely that the bleaching craze and the revenue it generates will wane. However, there will be advances in the treatment of dental disease that will result in the emergence of a new role for the general practitioner, and the profession will renew its position as pre-eminent in matters of oral health. ■■■■

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Journal Series on Caries Garners National Attention

By CDA Journal Staff

The February and March 2003 two-part Journal of the California Dental Association series titled "Caries: Moving From Restoration Toward Prevention" has received significant interest from not only California dentists, but also from individuals and organizations interested in oral health from across the nation and around the world. The CDA Foundation purchased an additional 2,000 copies of the series and has already exhausted its supply.

The success of the Journals and the accompanying DVD containing six educational prevention videos (inserted into the February edition) began in April when two of the educational videos won national awards for Non-broadcast Film/Video & Television Programs from the Telly Awards media competition. The winners were "Cavity-Free Families" and "My Trip to the Dentist." The Telly Award has become one of the most sought-after awards in the television, commercial, and video industry. Video, film, and program winners from the competition included A&E television, The History Channel, National Geographic Channel, Discovery Channel, and Walt Disney Studios. The awards, founded in 1980, showcase and give recognition to outstanding non-network and cable TV commercials, film and video productions, as well as non-network TV programming.

The Journal series was also highlighted at the 2nd Annual International Conference on Social Marketing. The conference, sponsored by Convenience Advertising International, brought public health officials from Australia, New Zealand, and Ireland together to discuss international strategies for public health promotion. Jon Roth, CAE, executive director of the CDA Foundation, gave the keystone lecture on the scientific articles contained in the Journal series as well as on the prevention videos and community-based strategies available through the research.

The Journal series also captured the interest of the National Head Start Association, which invited Roth and Healthy Smiles Manager Annie Gronewald, MPH, to the national convention to present to directors of Head Start programs from around the country. The conference highlighted the research contained in the Journal series and Gronewald's local dental health program, a community-based training program that she developed from the research. The lecture resulted in more than 200 Head Start directors receiving the research and a free copy of the community-based curriculum for their Head Start programs.

The articles have also received national attention. Requests for the articles have come from many types of community programs, dental education institutions, and dental organizations such as the Hispanic Dental Association, Arizona State School of Dentistry, the University of Washington, and the University of Texas -- San Antonio.

Perhaps the most far-flung request from was public health officials in Cochabamba, Bolivia. Joseph Mercardante, DDS, of San Luis Obispo, Calif., recently traveled to Bolivia on a mission to help provide dental care for underserved people in Cochabamba. Mercardante brought the Spanish language prevention videos, playing them at the treatment clinic for the local residents. A Bolivian health official was so impressed with the educational messages that they are considering placing the videos on Bolivian public television.

To review the February and March editions of the Journal or to order the accompanying DVD, please visit www.cdafoundation.org.

ADA Session Health Screenings Broadened

The health screening program during the ADA Annual Session in San Francisco this October has been expanded to include mental health screening and cardiac C-reactive protein evaluation to check for heart disease risk.

The annual ADA Foundation health screenings will be available in Moscone Center North, Hall D, for four days, Thursday, Oct. 23, through Sunday, Oct. 26, from 9 a.m. to 4 p.m.

"While the ADA Foundation's Health Screening Program has gathered the largest national database in the health of dental professionals during the past four decades, there is very little data regarding depression or other mental health conditions among dentists," says Dr. Anthony Volpe, president of the Foundation Board of Directors. "By gathering this confidential information from volunteers, the profession can better respond to the overall health of the dentist."

Participants will also receive 10 additional free screens, including hepatitis B and C, Legionella pneumophilia antibodies, cholesterol/HDL and LDL, blood pressure and weight, head and neck exam, latex hypersensitivity, carpal tunnel syndrome, electrocardiogram, urinary mercury, and periodontal screening and recording.

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Common Treatment for Acne May Cause the Appearance of Discolored Gums

A case report published in this month's Journal of Periodontology reported that minocycline, a commonly prescribed antibiotic for the treatment of acne and rheumatoid arthritis, can cause the teeth and bone to discolor, which may make gum tissue appear blackish-blue in color. Patients who take this drug or health care professionals who prescribe it should be made aware of the possibility of oral discoloration.

Mayo Clinic researchers were presented with a 29-year-old white female patient referred to the Periodontics Department by her dermatologist for an evaluation of the dramatic blue appearance of the gum tissue and bone surrounding her teeth. A review of her medical history indicated that she had been taking 50 mg of minocycline four times a day for the previous 17 months.

"We informed the patient that in addition to the bone discoloration, her permanent teeth could also become discolored with continued use of minocycline. And, unlike the periodontal bone, teeth discoloration from minocycline does not always resolve after discontinuation of the therapy," said Phillip J. Sheridan, DDS, Mayo Clinic, Periodontics, Department of Dental Specialties. "In this patient's case, the dermatologist elected to change antibiotics to treat her acne."

According to this case report, approximately 3 percent to 6 percent of long-term minocycline users will develop dental staining. This discoloration does not harm the teeth, bone or gum tissue, but is the reason behind the blackish-blue appearance of the gums. The periodontal bone can become discolored from minocycline therapy and show through the gum tissue, causing it to appear discolored as well.

Use of Internet for Health Information Not as Common as Thought

The Internet is used moderately for health information and has less substantial effects on actual health care utilization than thought, according to an article in the May 14 issue of the *Journal of the American Medical Association*.

The Internet has attracted considerable attention as a means to improve health and health care delivery, but it is not clear how prevalent Internet use for health care really is or what impact it has on health care utilization. Available estimates of use and impact vary widely. Previous estimates suggest that more than half and as much as 80 percent of adults with Internet access use the Internet for health care purposes. Without accurate estimates of use and effects, it is difficult to focus policy discussions or design appropriate policy activities.

Laurence Baker, PhD, of Stanford University School of Medicine, and colleagues assessed the extent of Internet use for health care among a representative sample of the U.S. population, examined the prevalence of e-mail use for health care, and examined the effects that Internet and e-mail use has on users' knowledge about health care matters and their use of the health care system.

The study was based on a survey conducted in December 2001 and January 2002 among a sample drawn from a research panel of more than 60,000 U.S. households. Responses were analyzed from 4,764 individuals aged 21 or older who were self-reported Internet users.

The survey found that "approximately 40 percent of respondents with Internet access reported using the Internet to look for advice or information about health or health care in 2001. Six percent reported using e-mail to contact a physician or other health care professional. About one-third of those using the Internet for health reported that using the Internet affected a decision about health or their health care, but very few reported impacts on measurable health care utilization; 94 percent said that Internet use had no effect on the number of physician visits they had and 93 percent said it had no effect on the number of telephone contacts. Five percent or less reported use of the Internet to obtain prescriptions or purchase pharmaceutical products."

The researchers add that with about half of the adult U.S. population using the Internet at all, these findings suggest that about 20 percent of the entire adult population in the U.S. used the Internet for health care purposes in 2001.

"We also found that Internet use for health is relatively infrequent. Seventy-eight percent of those who ever used the Internet for health care in 2001 reported using it every two to three months or less. Only 22 percent of those who ever used the Internet reported using it once a month or more. Again, our estimates are much lower than those reported in other studies. One recent report indicated that 59 percent of adults who search for health information online do so about once a week to once a month," they wrote.

The authors concluded: "We found evidence of moderate rates of use of the Internet for health care among adult Internet users, moderate effects of the Internet on the knowledge of users, and very small effects on actual use of office visits, telephone calls to health care professionals, and pharmaceutical purchases. Nonetheless, the Internet clearly is an important tool with the potential to improve information dissemination and perhaps to improve health care delivery and outcomes. Continuing efforts to maximize the potential of this tool could have great value."

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Researchers Find a Link Between Obesity and Periodontal Disease

Researchers from Case Western Reserve University have found a significant association between obesity and prevalence of periodontal disease, especially among individuals aged 18 to 34 years. Study findings were published in the May issue of the Journal of Periodontology.

The study looked at 13,665 people, and all participants underwent a periodontal examination. Body mass index and waist circumference were used to indicate obesity. The relationship between obesity and periodontal disease among individuals aged 18-34 years was 76 percent higher than normal-weight individuals in this age group. No significant association was found between body weight and periodontal disease in the middle and older age groups.

Several explanations for the association between obesity and periodontal disease in younger adults and not older adults are plausible. The younger people in the study may have different dietary patterns than older study participants. Research in dietary trends in adolescents ages 11 to 18 reveal a significant decrease in raw fruit and non-potato vegetables, which are sources of vitamin C. In addition, adolescents have decreased their calcium intake and increased their intake of soft drinks and noncitrus juices. This is important to oral health because low dietary intake of calcium and vitamin C have been associated with periodontal disease.

"Periodontists have known for a while that people who consume less than the recommended dietary allowance for calcium and vitamin C have slightly higher rates of periodontal disease. Young people are now drinking more soft drinks and noncitrus juices than milk and healthier beverages, decreasing their vitamin C and calcium intake" said Mohammad S. Al-Zahrani, DMD, Centers for Health Promotion Research, Case Western Reserve University. "Periodontitis has long been considered an 'older person's' disease, as more than half of people aged 55 or older have it. We now know that widespread risk factors such as obesity may also compromise periodontal health in younger populations."

"This is one more finding that shows healthy nutrition and adequate physical activity are necessary for overall health, and may also help to improve periodontal health by reducing the rate of progression of periodontal disease," said Gordon Douglass, DDS, president of the American Academy of Periodontology.

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Leisure Activity Associated With Reduced Risk of Heart Disease

Physical activity during free time, but not strenuous physical activity at work, is associated with a decreased risk of coronary heart disease, according to an article in the May 26 issue of the Archives of Internal Medicine.

According to information in the article, cardiovascular diseases are the leading cause of disability and death in the United States and other developed countries, and half of all cases are caused by coronary heart disease. Physical activity has been widely acknowledged as beneficial for cardiovascular health, but the amount of physical activity needed for health benefits is debated; and the role of work place physical activity and strain has not been widely studied.

Wolfgang Koenig, MD, of the University of Ulm Medical Center, Ulm, Germany, and colleagues assessed leisure time physical activity and work-related physical strain among 312 patients aged 40 to 68 years old with coronary heart disease and 479 age- and sex-matched patients without heart disease. Patients were asked about physical activity during their leisure time and at work during the summer and winter.

The researchers found an inverse association between leisure time physical activity and risk of coronary heart disease. Compared with patients who reported no leisure activity in the summer, there was a 15 percent reduction in risk for coronary heart disease in the group reporting less than one hour per week of activity; a 40 percent reduction in risk for coronary heart disease for those reporting one to two hours per week; and a 61 percent reduction in risk for those reporting more than two hours per week. Similar results were obtained for winter activity.

The researchers also found a strong positive association between work-related physical strain and risk of coronary heart disease and an inverse association between leisure time physical activity and levels of several biomarkers in the blood (such as c-reactive protein) that are involved in the inflammatory response (which is thought to be involved in the buildup of plaques in the blood vessels).

"The present study provides additional evidence that leisure time physical activity, but not work-related physical strain, is associated with a decreased risk for coronary heart disease seen at even moderate levels," the authors wrote. "It further suggests that leisure time physical activity is associated with a beneficial effect on the inflammatory response potentially involved in atherogenesis [hardening of the arteries]. These data therefore strongly support the recommendation of leisure time physical activity in the general population for the prevention of coronary heart disease."

Honors

Mahmoud Torabinejad, DMD, MSD, PhD, of Loma Linda, Calif., has been elected president of the American Association of Endodontists.

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Esthetics: A Fundamental Component of Prosthodontics

Krikor Derbabian, DDS

CONTRIBUTING EDITOR

Contributing Editor
Krikor Derbabian, DDS, maintains a practice limited to prosthodontics. He is the principal of the Center for Prosthetic Dentistry, a prosthodontic group practice with locations in Burbank and Pasadena, Calif.

Dentistry has undergone major changes in the past 25 years. Most of these changes have originated from advances in materials and technology and the widespread acceptance of dental implants. In the field of prosthetic dentistry, where the emphasis used to be primarily on restoring function and comfort, the present-day provider of care must also pay close attention to a third component: esthetics. Today's patients have high expectations regarding esthetics and providing functional and comfortable restorations alone may not be sufficient to satisfy many of them. Choice of restoration type and adjunctive procedures can affect the esthetic outcome of prosthetic dental care.

With heightened esthetic expectations, it becomes imperative that the restorative dentist understands the patient's desires and expectations prior to initiating irreversible therapy. More emphasis should be placed on diagnosis and treatment planning because in most situations, the proper diagnosis will dictate the appropriate treatment plan. Since esthetics is a subjective criterion, good communication is critical to understanding the patient's esthetic goals. Education of the patient with respect to anatomic and technical limitations is required as part of every patient's initial examination. In addition, proper interspecialist communication is of the utmost importance. Most treatments are multidisciplinary in their approach, so each member of the treatment team must understand the treatment goals.

In addition to the above discussion, patients should also be informed about the longevity of restorations, especially when otherwise healthy teeth are to be restored for elective procedures. Devan stated this best, "Our objective should not be the meticulous restoration of what is missing but the perpetual preservation of what remains" He admonished all clinicians that prosthetic treatment should not hasten the loss of the remaining dentition.

When providing elective procedures to healthy dentitions, Devan's admonition carries even more weight. Other authors have also noticed the commonplace sacrifice of tooth structure in the name of "cosmetic" or "esthetic enhancements." When this is contemplated, patients must be informed of the disadvantages of preparing tooth structure.

In summary, while more emphasis is placed on esthetics, we should not forget that our goal is to preserve what remains. When treatment is necessary, all principles of esthetic dentistry should be applied. This can be achieved with all types of dental prostheses. Each restoration type has its indication depending upon patient presentation and preference. The articles in this issue have been assembled to address esthetics as a funda-

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mental component of prosthodontics.

- In the first article, Winston W.L. Chee, DDS, and I describe several relatively straightforward techniques that can assist in the communication between the treating dentist, the patient, and the other members of the team, including the laboratory technician and other allied specialists.
- Sajid A. Jivraj, DDS, MSEd, and Winston W.L. Chee, DDS, illustrate how esthetics can be enhanced with traditional fixed prosthodontics. Several cases are presented.
- Terry E. Donovan, DDS, and George C. Cho, DDS, show how esthetics can be achieved in removable prosthodontics with proper treatment planning.
- In his article, Winston W.L. Chee, DDS, brings his expertise in discussing restoratively driven treatment planning and soft-tissue management for optimal implant esthetics.
- Lastly, Terry E. Donovan, DDS, and George C. Cho, DDS, discuss the role of all-ceramic crowns in contemporary restorative dentistry. While this class of restorations has improved esthetic properties and mimic natural teeth very well, they do have some limitations, which are discussed.

Although this issue may be different from many related to cosmetic dentistry, it is my hope that it reminds us that esthetics is only one component of prosthodontics; and, as part of the health care profession, each clinician must weigh the benefits, costs, and risks prior to initiating irreversible treatment that may reduce the life of the dentition.

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Simple Tools to Facilitate Communication in Esthetic Dentistry

Krikor Derbabian, DDS, and Winston W.L. Chee, DDS

ABSTRACT Communication is a critical element to obtaining satisfying results with esthetically driven treatment. Communication must first be established with the patient then among all the clinicians and technicians involved with the treatment to achieve the esthetic goals of the patient. This article will review methods to communicate esthetic parameters to allied specialists and the dental technician.

AUTHORS

Krikor Derbabian, DDS, *maintains a practice limited to prosthodontics. He is the principal of the Center for Prosthetic Dentistry, a prosthodontic group practice with locations in Burbank and Pasadena, Calif.*

In the beginning, there was red compound. It was widely used by dentists of the day, not because of its uncanny ability to raise enormous blisters on skin and mucosa, nor its tendency to become a permanent fixture on any article of clothing it contacted, but because there wasn't anything else.

In a small laboratory on the outskirts of Peoria, Ill., amateur chemist and part-time tarot card reader Farley Krautzmeyer accidentally calcined some gypsum and ended up with slightly hydrated

Communication is a critical element to obtaining satisfying results with esthetically driven treatment.1-7 Communication must first be established with the patient then among all the clinicians and technicians involved with the treatment to achieve the esthetic goals of the patient.

The first step toward this communication is for the restorative dentist, who will ultimately be responsible for the outcome, to establish what type of restoration will be required. Based on this decision, it can be then decided if any adjunctive procedures will be needed to improve the patient's anatomic presentation.

For example, a patient with a low lip line may not require procedures to align the gingival margins or augment deficient ridges (Figures 1-3). Conversely, a patient with an active lip may require both hard- and soft-tissue augmentation to accommodate the esthetics demanded by the patient.

This article will review methods to communicate esthetic parameters to allied specialists and the dental technician. The more information that the restorative dentist can provide, the better the patient can be served.1,4-15

Digital Photographs

Digital photography is a simple and quick way to communicate an overview of esthetic parameters: facial form, profile, lip activity, gingival marginal relationships, incisal length, degree of translucency, size and shape of incisal mamelons, and other characteristics. A few digital photographs can provide much of this information (Figures 4-6).

More detail on the shape of teeth and approximation of shades can be made with larger magnifications, along with shade tabs held next to the natural teeth for comparison (Figures 7-11).

It is beyond the scope of this article to describe ideal requirements and processes for shade selection. This topic -- which includes optical properties of the shade

Figure 1. Anterior view of implant restoration from tooth No. 9 through No. 12.

Figure 2. Implants in position for restoration in Figure 1.

Figure 3. Anterior view of implants with lips retracted.

Figure 4. Preoperative view of patient with high lip line and discolored resin composite veneers on teeth Nos. 8 and 9.

Figure 5. Closest shade tabs at normal exposure to aid technician.

Figure 6. Closest shade tabs at lower exposure by 1 f-stop to aid technician.

Figure 7. Postoperative view of patient in Figure 7 with porcelain veneers in place.

Figure 8. Intraoral view of veneers post cementation on teeth Nos. 8 and 9.

tabs and ceramics, light sources, and effects of various backgrounds -- has been well-described by many authors.1,2,4-15 However, photographs are only two-dimensional depictions; and more information can be garnered with three-dimensional aids, which will be described in this article.

Modified Shade Tabs

Since teeth are seldom uniform in color, a perfect shade match often cannot be found in a single commercially available tab. A novel approach to accurately communicating color is to send a modified color tab to the laboratory technician. In these situations, a tab with a color higher in value and lower in chroma should be selected.1,15 An abraded tab of the selected color can be modified with surface colors to match the tooth. This modified color tab can be sent to the laboratory technician to be used to aid color matching. This method is especially useful to communicate unique characterizations that some teeth exhibit, such as enamel crack lines, proximal discolorations, or white decalcification patches (Figures 12-16). A useful container for this modified tab is a film canister in which the shade tab can be suspended to avoid disturbing any surface modifiers applied (**Figure 17**).

Surface Texture and Luster

In addition to color, surface texture and gloss can have a dramatic effect on the appearance of final restorations.15,16 The failure to duplicate these properties is the primary reason many restorations appear unnatural, even when an excellent color match is achieved. Photographs do not provide this important information, and gypsum models do not reproduce the fine surface texture of teeth; therefore neither can be used as a base for matching the surface texture and gloss.15,17 An easy method to transfer this information to the laboratory technician is to have a selection

Figure 9. Anterior view of implant restoration from tooth No. 9 through No. 12.

Figure 10. Implants in position for restoration in Figure 1.

Figure 11. Anterior view of implants with lips retracted.

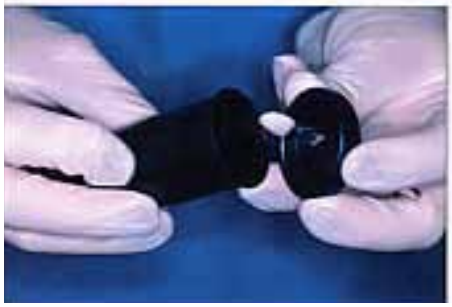

Figure 12. The modified shade tab can be sent to the laboratory in a film canister and used for the final shade matching of the restoration.

Figure 13 through 16. A selection of denture teeth can be modified with different levels of surface texture and surface luster. These tabs can be used to better communicate these two surface characteristics.

Figure 14.

of denture teeth with varying degrees of surface texture and gloss. The denture tooth with a similar pattern of surface texture and luster can be selected and sent to the laboratory technician for matching purposes (Figures 18 through 21).

Achieving the proper surface texture and gloss with this method is convenient, will complement the correct color selection, and will enhance the natural appearance of the restorations.

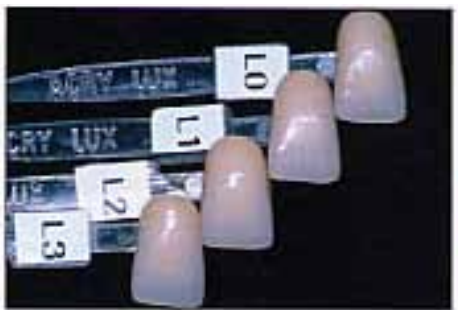

Figure 15.

Figure 16.

The Lip Impression

In an esthetically driven treatment plan, a three-dimensional aid such as a lip replica can be very helpful.1,13 It can be made with commonly available materials in the dental office. The lip replica represents a three-dimensional frame that is placed directly on the mounted casts with which one can evaluate and modify the smile line, the occlusal plane, the buccal corridors, and the tooth and gingival display. The lip replica is especially critical when contemplating significant repositioning of maxillary incisal edge position. In addition to being an important diagnostic tool, it can also be a useful to facilitate communication with the patient and to put the diagnostic wax-up into a more realistic perspective when evaluating it on the articulator. For immediate denture situations, the lip replica can be used to prepare an esthetic denture setup because it can include important information such as smile line, lower lip position, buccal corridors, and midline (Figures 22 through 26).

The Acrylic Veneer Overlay

The acrylic veneer overlay can provide information regarding the display of anterior teeth both gingivally and incisally.1,13,18 An additive wax-up is made from a diagnostic casts to ideal form. and a labial veneer is made from the wax-up. This veneer can be tried in for patient approval, used as a surgical

Figure 17. The smile replica can be made in the dental office.

Figure 18. An impression is made over a custom bitefork.

Figure 19. The impression/bite assembly is loaded with putty impression material and seated on the articulated models.

template for crown lengthening, and used as a guide for fabrication of the definitive restorations.

The following presentation describes the use of this type of overlay. The patient depicted was referred with the chief complaint of "I don't like the appearance of my front teeth" (Figures 27 and 28). During the patient interview and after analysis of anterior tooth display, it was determined that the incisal edges were aligned well and in harmony with the smile line of the lower lip as was proper for teeth without wear. The gingival margins, however, were found not to be in harmony, which resulted in a less than ideal display of the incisors. The teeth were unrestored, and the most conservative treatment was offered to the patient -- a combination of crown lengthening and bleaching of the teeth. A crown lengthening guide was fabricated and placed intraorally (**Figure 29**). At this time, the patient was able to preview the intended changes and provide feedback (**Figure 30**). With the patient's approval, the crown lengthening procedure proceeded with use of the surgical guide (**Figure 31**). Once the treatment was completed, the teeth were lightened with home bleaching (**Figure 32**). In situations where there is severe wear and the teeth require restorations, the gingival margins are aligned for esthetics and the incisal edges are corrected with restorations (**Figure 33**). Besides being representative of the use of the acrylic overlay for communication to patient and allied specialists, this case is an excellent example of conservative treatment. It cannot be overemphasized that the longevity of the dentition must be taken into account with each esthetic procedure undertaken. This is especially the case when performing elective procedures on healthy dentition.19

Figure 20. The completed smile replica on the articulated models.

Figure 21. The smile replica provides valuable information -- such as midline, smile line, and buccal corridors -- to complete the diagnostic wax-up.

Figure 22. Patient presentation on referral from orthodontist prior to debanding. Note proper alignment of incisal edges and uneven gingival margins.

Figure 23. Patient in Fig 22 with lips retracted.

Soft-Tissue Casts for Implants and Ovate Pontic Sites

Provisional restorations are commonly used to shape and form pontic sites or peri-implant mucosa.20-23 The shape and form of the soft tissue should be transmitted to the dental technician so that the restorations made will conform to the soft-tissue contours intraorally

Figure 24. Acrylic overlay in place for patient preview and operator assessment.

Figure 25. Intraoral view of teeth Nos. 6 through 11 after crown lengthening.

Figure 26. Patient's smile after crown lengthening and bleaching.

Figure 27. Patient ready for restorations after orthodontic treatment. Note alignment of gingival margins when there is wear of incisal edges.

Figure 28. Occlusal view of ovate pontic receptor sites.

Figure 29. Putty index with provisional restoration in place; soft-tissue cast material is being placed.

Figure 30. The index with provisional restoration and unset soft-tissue cast material is placed onto the master cast to form the ovate pontic receptor sites -- note the removal of the dies from the master cast to facilitate seating of the index and to prevent damage to the dies.

Figure 31. The formed ovate pontic receptor sites to the provisional restoration.

Figure 32. The provisional restoration in place with putty index removed after setting of the soft-tissue cast material.

(**Figure 3**4). The soft tissue cast formed with the use of provisional restorations will provide three-dimensional information to the dental technician.

An intraoral overimpression is taken of the provisional restoration and adjacent teeth. A soft-tissue cast material can be extruded around the ovate pontics to replicate the shape and form of the ridge area formed intraorally (**Figure 3**5). The edentulous area of the master cast is reduced, and the dies are removed to facilitate seating of the index with the provisional restoration (**Figure 3**6). The soft-tissue model can then be used to fabricate the definitive restorations (Figures 37 and 38). Note the form of the tissue with and without the use of this technique (**Figure 3**9).

Summary

A few simple techniques to aid clinicians with communication have been described; visualization in three

Figure 33. Occlusal view of the uncorrected master cast pontic area.

dimensions is most helpful in transferring information with respect to esthetics.

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An Interdisciplinary Approach to Treatment Planning in the Esthetic Zone

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ABSTRACT The practice of prosthodontics requires a multidisciplinary approach that integrates the knowledge, skills, and experience of all the disciplines of dentistry into a comprehensive treatment plan. This article outlines a comprehensive interdisciplinary treatment philosophy designed for developing the foundation for optimal esthetics in fixed prosthodontics. Cases are presented to illustrate the utility of interdisciplinary treatment in which specialists are recruited to enhance and improve a patient's dental function and esthetics.

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The practice of prosthodontics requires a multidisciplinary approach that integrates the knowledge, skills, and experience of all the disciplines of dentistry into a comprehensive treatment plan. Fixed prosthodontic treatment can offer exceptional satisfaction to both the patient and dentist. It can transform an unhealthy, unattractive dentition with poor function into a comfortable, healthy occlusion with greatly enhanced esthetics.1

To obtain optimal functional and esthetic results from dental treatment, meticulous attention must be paid to myriad details. The process starts with the patient interview and meticulous treatment planning, then continues through active treatment and culminates in regular follow-up care.

The objectives of this treatment process are to improve oral health, establish proper occlusal function, and create the most ideal esthetic result possible. It is only through an organized and systematic approach that appropriate diagnoses can be made and, based on these diagnoses, functional and esthetic problems can be addressed predictably.

Interdisciplinary therapy involves the combination of diagnostic, treatment planning, and therapeutic procedures. It is imperative that the team leader appropriately select a team of practitioners. The selection process can have a great impact on the overall treatment. Each provider on the team must have an optimal level of skill in his or her area of expertise to positively contribute to the overall result.2 The complex nature of dentofacial problems necessitates a highly organized method of communication among the team members so that all aspects of treatment can be equally considered. It

Figure 1. Fixed partial denture on Nos. 7 through 9. The patient's particular concerns were color, shape, and size discrepancy among teeth Nos. 7, 8, 9, and 10.

Figure 2. Periapical radiographs of teeth Nos. 7 through 10, demonstrating advanced bone loss on No. 10.

Figure 3. Diagnostic wax pattern of teeth Nos. 7 through 10 to communicate desired end result.

Figure 4. Orthodontic extrusion of tooth No. 10, which proceeded at a rate of 1 mm a week with a stabilization period of one month for each millimeter of tooth extruded.[5]

Figure 5. Excisional gingivectomy to harmonize gingival levels with contralateral side.

Figure 6. Labial view of final restorations.

is through this communication that an interdisciplinary treatment plan can be formulated prior to generation of a joint treatment letter. This treatment letter should include a discussion of the aspects of treatment that will be provided by each team member, the time frame of the proposed treatment, the inherent risks involved, informed consent, and the financial responsibilities of the patient. The quality of treatment depends upon the quality of the communication. It is critical that the team leader maintain communication with the specialists both during treatment and once it has been completed. It is only through this approach that optimal care can be delivered and regular follow-up care can be implemented.

This article outlines a comprehensive interdisciplinary treatment philosophy designed for developing the foundation for optimal esthetics in fixed prosthodontics. Three cases are presented to illustrate the utility of interdisciplinary treatment in which allied specialists are recruited to enhance and improve a patient's function and esthetics.

Case 1

A 49-year-old male disliked the appearance of his maxillary fixed partial denture and wanted to restore the teeth to more ideal esthetics (**Figure 1**). His particular concerns were the color and shape of the teeth as well as the size discrepancies among teeth Nos. 7, 8, 9, and 10.

Tooth No. 10 exhibited advanced bone loss and was deemed to have a poor prognosis (**Figure 2**). Probing to the osseous crest under local anesthetic at the midfacial aspect of tooth No. 7 exhibited a distance of 5 mm from the free gingival margin to the osseous crest. The soft tissue levels also exhibited a discrepancy, with the gingival level of No. 10 being apical to that of teeth Nos. 7, 8, and 9.

An analysis of the anterior teeth of this patient indicated a number of issues that could be corrected to improve their esthetics. These included balance of gingival levels, relative tooth dimensions, tooth characterization, surface texture, color, and smile symmetry.3 To confirm that the analysis matched the perceptions of the patient, a diagnostic wax pattern was formed and an acrylic resin template of the wax pattern fabricated. This template served to communicate the desired result to the patient4 (**Figure 3**). Approval from the patient was obtained and the treatment plan formulated and put into action.

From the esthetic evaluation, it was determined that the gingival contours

required alteration. This objective would be achieved using a combination of orthodontic and periodontal treatment.

The treatment outline for Patient 1 was as follows:

1. Orthodontic treatment;
2. Provisionalization;
3. Periodontal treatment;
4. Definitive restoration.

Forced eruption of tooth No. 10 was initiated although eventual extraction of the tooth was planned. To augment the ridge contour of this area, this movement proceeded at a rate of 1 mm per week with a stabilization period of one month for each 1 mm of extrusion (**Figure 4**).5 Simultaneously with the extraction of tooth No. 10, the fixed partial denture (from Nos. 7 to 10) was removed and the abutments re-prepared. A provisional restoration was fabricated with ovate pontics in the region of teeth Nos. 8 and 10. The ovate pontic in the region of tooth No. 10 was positioned approximately 3 mm apical to the facial gingival margin inside the extraction site. This served as a tissue scaffold to guide the pontic site development.6

At a subsequent appointment, an excisional gingivectomy was performed around tooth No. 7 to harmonize the gingival level with that of the contralateral lateral incisor (**Figure 5**). The soft tissue was allowed to stabilize for six months prior to re-preparation of the abutment teeth and relining of the provisional restoration.7

The definitive restoration was a metal-ceramic fixed partial denture spanning teeth Nos. 7 to 10 with ovate pontics in the region of teeth Nos. 8 and 10 (**Figure 6**).

Without the participation of other specialties and a proper treatment plan, it would not be possible to achieve the result obtained.

Case 2

A 47-year-old female was unhappy with the appearance of her maxillary anterior teeth. She requested that they be restored to more ideal esthetics. Her specific complaint was the shape and color of the metal-ceramic crowns on teeth Nos. 8 and 9. The patient also commented that the position of the teeth were "a little out" (Figures 7 and 8).

The patient interview revealed that she had suffered trauma to teeth Nos. 8 and 9 when she was 9 years old. On clinical and radiographic examination, it was found that teeth Nos. 8 and 9 had been restored with cast post and cores and metal-ceramic crowns. The post and cores were of tapering design and appeared to have intimate adaptation with the canal walls (**Figure 9**).

The soft-tissue levels of the maxillary anterior teeth also exhibited a discrepancy, with the gingival level of

Figure 7. Labial view of metal-ceramic restorations on teeth Nos. 8 and 9. The patient's particular complaint was color, shape, and size discrepancy between teeth.

Figure 8. Lateral view of metal-ceramic restorations. The patient's specific complaint was the protrusion of the anterior teeth.

Figure 9. Periapical radiographs of teeth Nos. 8 and 9 demonstrating size and shape of cast posts.

Figure 10. The orthodontic phase included extrusion of No. 10 and retraction of teeth Nos. 7, 8, 9, and 10

Figure 11. The diagnostic wax pattern for crown lengthening template.

Figure 12. Initial incisions and scallop of gingiva following outline dictated by crown lengthening template.

tooth No. 10 being apical to that of teeth Nos. 7, 8, and 9.

Consultations with an orthodontist, periodontist, and endodontist proceeded; and an interdisciplinary approach was initiated.8

The patient was not exhibiting symptoms related to the existing endodontic treatment. Consequently, a decision was made to leave the existing post and cores in place. It was believed that attempted removal would incur greater risk to the teeth.

The treatment outline for Patient 2 was as follows:

1. Provisionalization;
2. Orthodontic treatment;
3. Periodontal treatment;
4. Re-provisionalization;
5. Definitive restoration.

The crowns on teeth Nos. 8 and 9 were removed and provisional restorations fabricated prior to referral of the patient to the orthodontist. The orthodontic treatment consisted of retraction of teeth Nos. 7, 8, 9, and 10 and extrusion of tooth No. 10 (**Figure 10**). The left lateral incisor was extruded to relocate the gingival margin more coronally to match the gingival margin of the left canine.

Prior to referral to the periodontist, diagnostic wax patterns were completed and used to fabricate a surgical guide for the crown lengthening procedure (**Figure 11**). Use of the surgical guide was necessary so the surgeon could identify the future location of the restorative margins and ensure that at least 3 mm of clearance would exist between the restorative margin and the crest of the alveolar bone9 (Figures 12, 13, and 14).

After waiting six months for healing and stabilization of the gingival margins,6 new provisional restorations were fabricated (Figures 15 and 16).

The definitive restorations included porcelain-fused-to-metal ceramic restorations on teeth Nos. 8 and 9 and small composite resin restorations on teeth Nos. 7 and 10 (Figures 17 and 18).

Figure 13. Presentation prior to osseous surgery.

Figure 14. Presentation following osseous removal for crown lengthening.

Figure 15. TGingival crest was allowed to stabilize for six months.[7]

Figure 16. New provisional restorations fabricated for teeth Nos. 8 and 9.

Figure 17. Close up of metal-ceramic restorations on Nos. 8 and 9 and composite resin restorations on Nos. 7 and 10.

Figure 18. Lateral view of metal-ceramic restoration on Nos. 8 and 9 illustrating change in labial inclination of these teeth as compared to the preoperative situation.

Case 3

A 22-year-old male disliked the appearance of tooth No. 8 and requested that it be restored to more ideal esthetics. This patient had suffered trauma to tooth No. 8; and, following endodontic treatment and orthodontic extrusion, it was restored with a metal-ceramic crown. In comparison to the contralateral tooth, tooth No. 8 exhibited an occlusogingival size discrepancy and a slightly shorter incisal edge length3 (**Figure 19**).

The treatment outline for Patient 3 was as follows:

1. Periodontal treatment;
2. Provisionalization;
3. Definitive restoration.

This patient presentation illustrates the need for all practitioners involved in treatment to understand that each phase

of treatment will affect the next phase. The periodontal and restorative treatment plan was to perform crown lengthening of tooth No. 8 to achieve a similar gingival form to the contralateral tooth. However, due to a tapering root form of tooth No. 8 and a more palatal position of the facial aspect of the root, symmetry was difficult to achieve10 (**Figure 20**). Mesiodistally, the differing dimensions were compensated for by having deeper than normal mesiodistal margins while taking care not to violate the biologic width11 (Figures 21 and 22). It was not possible to compensate for the discrepancy of the root size faciolingually. This difference could only have been compensated for through the tooth being erupted more labially during the orthodontic phase (Figures 23 and 24). This treatment example illustrates the need for each participant in interdisciplinary treatment to visualize the ultimate form of the restoration.

Summary

This article illustrates the advantages of an interdisciplinary approach to the management of patients who require fixed prosthodontic care. Treatment planning must begin through visualization of the end result. By paying attention to details and systematically analyzing each factor that affects the esthetic result and recognizing inadequacies in crown contour and gingival margin levels prior to restorative intervention, the restorative dentist can take advantage of the benefits of orthodontic and periodontal treatment to enhance the esthetic and functional outcomes. Without an interdisciplinary approach, final outcomes can be compromised. With a team approach to the management of patients who require fixed prosthodontic treatment, fewer compromises will occur and more ideal restorations can be developed.

Figure 19. Preoperative labial view of existing restoration and patient presentation.

Figure 20. Incisal view of preparation illustrating narrow root form and palatal position of root compared to contra lateral tooth.

Figure 21. Provisional restoration after crown lengthening -- note narrow cervical contours.

Figure 22. Provisional restoration after tissue maturation and re-preparation of the tooth and deep interproximal margins to allow development of more natural contours.

Figure 23. Close up of retracted smile.

Figure 24. Patient's smile.

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Esthetic Considerations With Removable Partial Dentures

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ABSTRACT The reduction in partial edentulism that has occurred due to successful preventive procedures and the predictable use of osseointegrated implants has reduced the need for removable partial dentures. However, for a variety of reasons, many patients can continue to benefit from partial denture therapy; and these patients deserve the best esthetic result possible. The primary esthetic objection to removable partial denture therapy is the unsightly display of the clasp assemblies. This article describes three strategies that can be used by the discriminating clinician to eliminate the display of the clasp assembly and provide an esthetic and functional removable prosthesis.

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The emphasis on esthetic dentistry has increased in the past two decades. This increase has also resulted in an increase in the amount of restorative dentistry that is essentially esthetically driven. In addition, the tremendous emphasis on preventive dentistry that began in the 1960s and continues to the present day has reduced the incidence of partial edentulism for the majority of North American adults. The high success rates reported with osseointegrated implants has permitted the routine restoration of edentulous spaces with implant-supported fixed restorations and has reduced the need for removable partial dentures.

It is clear that most practitioners pay meticulous attention to detail when providing services such as porcelain veneers, metal-ceramic and all-ceramic crowns, fixed partial dentures, and basic direct and indirect operative dentistry. However, in the opinion of the authors, this meticulous attention to detail is lacking in many practices in the discipline of removable partial prosthodontics.1 This situation is likely due to the reduced number of removable partial dentures fabricated in most contemporary practices, combined with a reduced emphasis in removable prosthodontics in many dental school curricula.

However, a significant number of patients with partial edentulism are unable to take advantage of implant therapy because of financial, anatomic, psychological, or systemic health constraints. These patients can derive considerable esthetic and functional benefits from removable partial denture therapy. This article describes several strategies for providing a highly esthetic removable partial denture for those patients who could benefit from such therapy.

Many patients believe that removable partial dentures are inherently damaging to the natural dentition, and indeed a well-known prosthodontist once wrote, "A removable partial denture is a device for extracting one's teeth slowly, painfully

Figure 1 and 2. The unsightly display of the clasp assemblies on these removable partial dentures is objectionable for most patients.

Figure 2.

Figure 3 and 4. This patient's smile permits esthetic reconstruction with a mandibular removable partial denture using the RPI design concept.

Figure 3.

and expensively."2 This statement is undoubtedly true with poorly designed and fabricated removable partial dentures, and there are several articles that clearly document the potentially deleterious consequences of removable partial dentures.3-9 However, there are also several well-documented studies that indicate that properly designed, fabricated and maintained removable partial dentures can provide esthetic and functional long-term benefits with minimal negative consequences.10-14

The primary esthetic deficiency resulting from removable partial denture therapy is the unsightly display of conventional clasp assemblies (Figures 1 and 2). This display is not an inevitable consequence of removable partial denture therapy, and often it can be avoided simply by analyzing the patient's smile and dental display and designing a removable partial denture with the clasp assemblies in nonvisible locations.

In addition to this basic principle, there are three specific strategies that can be utilized to design both functional and esthetic removable partial dentures. These strategies include use of infrabulge rather than suprabulge clasp assemblies, the very selective use of precision and semi-precision attachments, and, where indicated, use of the concept of the rotational path removable partial denture. The appearance of clasp assemblies can also be improved with the use of tooth-colored or pink flexible polymer clasps. Little information on the long-term clinical performance of such clasps is available in the literature, and this approach cannot be recommended by the authors at this time.

Although beyond the scope of this article, it is important to understand that many factors unrelated to the clasp assembly affect the ultimate esthetic result achieved with a removable partial denture. Some of these factors include proper tooth selection, tooth placement, flange length and contour, and proper interdental papilla contours.

Infrabulge Clasp Assembly

The use of the infrabulge clasp assembly is the simplest approach to eliminating clasp assembly display and should always be considered before more complex solutions are utilized. The retentive arm of infrabulge clasp assemblies approaches the undercut on the tooth from a gingival direction rather than from the occlusal direction as is the case with suprabulge clasps. Depending upon the specifics of each individual patient's smile, this simple approach often eliminates or minimizes the display of the clasp assembly (Figures 3 and 4).

The most practical approach to designing such removable partial dentures is to utilize the RPI (rest, proximal plate, I-bar) concept originated by Kratochvil and modified by Krol.15,16 Both designs are acceptable. According to these authors, the advantages of infrabulge clasp assemblies designed according to these concepts include simplicity, cleanliness, and minimal interference with the natural contours of the abutment. In addition, with Kennedy Class I and II situations, these clasp assemblies are stress-releasing and thus can be used in both tooth-borne and distal-extension situations.17-20 Infrabulge clasps provide additional retention with a given undercut due to their inherent tripping action.21

While this approach does not automatically hide the clasp assemblies on every patient, it frequently is a very simple and effective means of providing an esthetically acceptable removable partial denture for many patients. With distal-extension removable partial dentures, the use of corrected impressions and the altered cast technique or a functional refit at the time of insertion is

Figure 5. Intracoronal attachments require the removal of significant amounts of sound tooth structure to accommodate the attachment within the confines of physiologic crown contour. This exacts a biologic price over time.

Figure 6. Extracoronal attachments create an alteration of the normal physiologic crown contour of the abutment tooth, which makes it difficult, if not impossible, to perform adequate oral hygiene procedures.

Figure 7. Secondary dental caries related to this extracoronal attachment necessitated removal of the fixed restoration.

indicated to provide optimum fit of the denture base and the residual ridge. This has been shown to minimize stress on the abutment teeth.15, 22-26 Unfortunately, these procedures are rarely utilized by most North American dentists in spite of the documented benefits they provide.27

Precision and Semiprecision Attachments

The second approach to concealing the clasp assembly is the use of precision or semiprecision attachments. It is the authors' opinion that precision attachments are generally poorly understood and overutilized by the profession.

Attachments may be classified as precision or semiprecision, intracoronal or extracoronal, and resilient or nonresilient. Precision attachments are machined by the manufacturer, while semiprecision attachments are custom fabricated by the laboratory technician. The major disadvantage with intracoronal attachments is that room must be made for the attachment within the crown. Box forms to accommodate the attachment must be prepared within the tooth at the time of tooth preparation. This removes a considerable amount of healthy tooth structure and often exacts a biologic price later (Figures 5).

Extracoronal attachments inherently result in overcontoured areas that prevent or complicate plaque removal (Figures 6 and 7). The lack of adequate oral hygiene that usually occurs frequently results in recurrent caries, destructive periodontal disease, or both. There are a wide variety of extracoronal attachments available; and they vary in design, size, and shape. In general, it is best to avoid extracoronal attachments with natural tooth abutments. If it is impossible to avoid use of such attachments, the smallest attachment that will do the job should be selected to minimize the effect on physiologic crown contour. The importance of excellent oral hygiene must be emphasized to the patient, and the patient should be recalled frequently to reinforce hygiene procedures and intervene promptly should pathology result.

In the opinion of the authors' most resilient attachments are to be avoided wherever possible. They rarely function in the manner intended, are inherently extracoronal in design, and are usually complex and technique sensitive. They often require an inordinate amount of maintenance over time.

Nonresilient attachments can be very difficult to fabricate, utilize frictional retention, and should only be used in tooth-borne situations. Such frictional retention is often very impressive initially, but is also often lost or substantially reduced over a short period. This again results in an inordinate amount of maintenance with an endless series of adjustments in a hopeless attempt to regain the initial level of retention.

Attachments are simply an esthetic replacement for a traditional clasp assembly. Thus, the clinician must analyze each attachment prior to use to ensure that its design will meet all the functions of a traditional clasp assembly. These functions include retention, support, bracing, reciprocation, encirclement, and passivity at rest.28,29 With Kennedy Class I and II situations, attachments should also be stress-releasing and utilize traditional occlusal or gingival rests to support the attachment and prosthesis. The reality is that very few commercially available attachments meet these specifications, and those that fail to do so should be avoided.

The authors have utilized two approaches using attachments that have proven to be successful and are worthy of consideration in certain specific cases. The first concept is that of the stable base precision attachment removable partial denture.30-33 This concept utilizes the concept of mucostatics, and the master impression is made using a cast aluminum custom tray and a zinc-oxide eugenol impression material of very low viscosity to obtain an impression of the ridge at rest (Figures 8). An extremely accurate partial denture base is fabricated and united to the fixed restorations using

Figure 8. Mucostatic impressions are made with a very low viscosity zinc-oxide eugenol impression material.

Figure 9. With the stable base precision attachment removable partial denture, the base is accurately related to the fixed component using an intraoral pick-up.

Figure 10. The stable base precision attachment removable partial denture produces an esthetic result with no display of clasp assemblies.

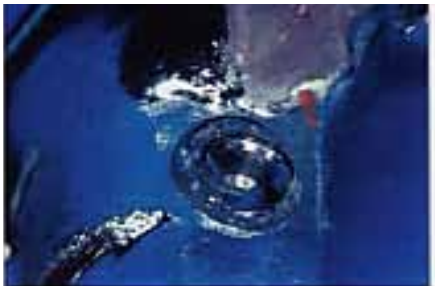

Figure 11. Plunger attachments can be adjusted to increase or decrease the desired amount of retention.

Figure 12. Plunger attachments are positioned in a custom cradle in the partial denture framework.

Figure 13. A milled lingual bracing arm with a positive proximal rest is the best method of ensuring stability of the position of the abutment tooth.

semiprecision attachments (Figures 9 and 10). A precise occlusion is established using gold occlusal surfaces attached to resin denture teeth. This approach is based on the concepts of mucostatics and the tissue-base-constant that have not been verified scientifically. In spite of this fact, the authors have experienced favorable results using these very detailed techniques.34 However, this is a very time-consuming technique, and meticulous attention to detail is required. It is likely that this approach is too technique-sensitive for routine use in the majority of general practices.

The second potentially useful approach using attachments involves spring-loaded plunger attachments.35 This is a relatively simple and practical approach that has proven to be versatile as well. The attachments are essentially spring-loaded plungers that can be adjusted to provide varying amounts of retention. They rest in custom cradles provided in the cast denture base and provide retention by engaging a dimple placed in the proximal surface of the abutment tooth or crown (Figures 11 and 12). As mentioned, these attachments are quite versatile and can be used in both tooth-borne and distal extension situations. In the latter cases, optimum fit of the base is obtained using the altered cast technique or a functional refit.

The clinician must understand that the constant force of the spring-loaded plunger against the abutment tooth has the potential of orthodontically moving the tooth and thus losing desired retention. Stability of the abutment teeth is obtained with careful design of the partial denture framework. A milled lingual bracing arm with a positive proximal rest is preferred, but a positive cingulum rest can work effectively as well (**Figure 13**). Splinting the abutment teeth is often desirable.

Rotational Path Removable Partial Dentures

The third approach that can be utilized to eliminate display of the clasp assemblies is the rotational-path removable partial denture. Although variations of this concept have been described for many years, this approach is also poorly understood by the majority of practitioners. However, in contrast to attachments, which tend to be over-utilized, the rotational path partial is underutilized.

This concept originated in the 1930s, and been described and extensively analyzed in the literature.36-46 This approach is ideal for the replacement of missing anterior teeth when replacement

Figure 14a through c. This rotational-path removable partial denture provides an excellent esthetic result for a patient missing several anterior teeth as well as a considerable amount of supporting tissues.

Figure 14b.

Figure 14c.

Figure 15a through c. Using the rotational-path partial denture concept, clasp assemblies can be moved from more anterior visible teeth to posterior teeth, thus providing an excellent esthetic result.

Figure 15b.

Figure 15c.

of the soft tissue with the denture base is also desirable. It is also indicated with missing anterior teeth when the remaining abutments are periodontally compromised and not ideal as fixed abutments. The rotational path partial can also be utilized to restore posterior edentulous bound spaces and has been advocated in specific Kennedy Class II situations.47

The basic concept with rotational path removable partial dentures is relatively simple but requires meticulous attention to detail if success is to be attained. The prosthesis is retained by rigid portions of the metal framework engaging proximal undercuts of the anterior abutment teeth. It is advisable that the wax-up of the framework be evaluated by the clinician prior to casting, and the work authorization should instruct the technician to block out any portion of the metal framework that is in contact with the abutment teeth prior to electropolishing.48,49 This will prevent loss of the intimate contact of the framework with the abutment teeth that is essential to provide retention.

The partial denture requires two paths of insertion, with the framework being placed into the undercut first and then rotated to seat the posterior clasp assemblies. When properly designed and fabricated, the removable partial denture cannot be dislodged by a force perpendicular to the plane of occlusion. The ultimate result is a retentive removable partial denture with no anterior clasp assemblies and the posterior assemblies in a position where they are not visible (Figures 14-18). While it is beyond the scope of this article to describe the precise details involved with designing and fabricating a rotational path removable partial denture, these details have been adequately described elsewhere.50

Conclusion

It is apparent that removable partial dentures often are not provided at the optimal level possible given the current level of knowledge. Clearly, patients requiring removable dentures have the same desires regarding esthetics as patients receiving fixed prosthodontic therapy and they deserve the best possible treatment outcome.

With removable partial dentures, the primary esthetic problem is display of the clasp assembly. This unaesthetic display can often be avoided by simply utilizing infrabulge clasps. Precision attachments are poorly understood and overutilized. The use of precision attachments can provide short-term esthetic results, but

Figure 16a through c. The posterior teeth in this patient are periodontally compromised and are poor candidates as abutments for a fixed prosthesis. The anterior teeth have been restored with acceptable esthetics using the rotational-path concept.

Figure 16b.

Figure 16c.

Figure 17. A vertical force resulting from tugging the anterior framework with dental floss will not dislodge the framework when the undercuts are properly engaged.

Figure 18a and b. The framework for this rotational-path removable partial denture is seated first into the planned undercut provided by the proximal surfaces of the anterior abutments and is then rotated into place. The rotational path partial denture provides excellent esthetics in the maxillary arch while the I-bar removable partial denture with infrabulge clasps does the same in the mandibular arch.

the fabrication of such prostheses is both complex and time-consuming, and the long-term maintenance required is a very significant problem. Clinicians should carefully consider other options before committing themselves and their patients to use of attachments.

Rotational-path removable partial dentures are also poorly understood and tend to be underutilized. They can, however, provide an exquisite, cost-effective means of providing excellent esthetics and function with a removable partial denture. This approach, where indicated, is highly recommended.

Finally, providing an excellent removable partial denture service is no different than providing an excellent service in other disciplines. It requires meticulous attention to detail in all phases of care delivery. The essential details are well-known and have been described in detail in the literature. This article has attempted to motivate practitioners to elevate their removable partial denture service to the level their patients deserve.

Acknowledgment

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Treatment Planning and Soft-Tissue Management for Optimal Implant Esthetics: A Prosthodontic Perspective

WINSTON W.L. CHEE, DDS

ABSTRACT Esthetic restoration of implants in the anterior region of the mouth is one of the most difficult procedures to execute. This article discusses patient selection criteria. Implant position and its relationship to the esthetic outcome are also addressed. The importance of soft-tissue management in all phases of the surgical and restorative phases is emphasized. Guidelines are given for the successful delivery of this service for the patient

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Root-form cylindrical implants placed following surgical techniques described by Brånemark and colleagues are a predictable method to anchor prosthetic devices to the jaw bone.1-3 Currently, clinicians can prescribe the use of implants with the knowledge and confidence that they will predictably integrate into the jaw bone and provide lasting anchorage to restorations. The esthetic outcomes are not as predictable or consistent, however. This paper will discuss pitfalls from a prosthodontic perspective that are often encountered when restoring the anterior area of the mouth. It is the opinion of the author that achieving an esthetic outcome when restoring implants in the anterior region is one of the most difficult restorative goals to accomplish. To achieve optimal esthetics, each phase of treatment must be well-executed -- from preparation of the implant recipient site to provisional phases prior to implant placement, to implant integration and post-implant integration, implant placement, and fabrication of the definitive restoration.

Patient Selection

Patients who are candidates for replacement of an anterior tooth with an implant-supported restoration must understand the benefits of an implant restoration. They must also understand the additional time required for treatment and additional costs that will be incurred. They should also be informed of the additional difficulties in obtaining an esthetic result. This is especially important with respect to lip length.4 If the lip length is low and the patient understands that this situation will not reveal the more apical portions of the restoration, many additional steps can be avoided in reconstructing these areas (Figures 1 and 2). However, when there is a high lip line or a demanding patient, the limitations of implant-supported restorations must be discussed in detail prior to commencing treatment (**Figure 3**).

Figure 1. Anterior view of patient smile showing display of implant-supported restoration from No. 6 through No. 10.

Figure 2. View of restoration in Figure 1 with lips retracted (note uneven clinical crown lengths, which are not visible with this patient's lip mobility).

Figure 3. Anterior view of patient smile displaying loss of papilla between teeth Nos. 8 and 9 with implant restoration. With these patients, it is much more difficult to achieve a satisfactory result.

Figure 4. Retracted view of anterior implant-supported fixed partial denture from No. 6 through No. 10 with No. 7 implant in poor restorative position due to insufficient bone.

Figure 5. Illustrating the transition in contour required from the implant to the emergence of the clinical crown from the mucosa.

Figure 6. Occlusal view of peri implant soft-tissue contours and ridge anatomy under ovate pontics for an implant-supported fixed partial denture.

Bony Anatomy of the Implant Site

For successful integration of implants, sufficient bone must be available to stabilize and house the implant. If the bony anatomy is inadequate, a bone grafting procedure may be required. When these situations are encountered, patients must be made to understand that they are missing more than just a tooth. They must also understand that they are missing hard and soft tissue5-7 (**Figure 4**).

Soft-Tissue Thickness Over the Implant Site

One of the prerequisites for having an implant-borne restoration appear similar to a natural tooth is the contour of the restoration. However, the cross-sectional diameter of an implant is approximately 4 mm and the dimension of a central incisor is generally about 7 mm in the cervical region. Sufficient soft-tissue thickness must be present to allow this smooth transition from a circular 4.0 mm to a triangular 7 mm cross-section to create the proper emergence profile and esthetics for the restoration.8,9 This also pertains to the pontic areas of fixed partial dentures (Figures 5 and 6).

Implant Position

In most situations involving anterior implant restorations, the esthetic considerations are more important than functional considerations. As such, axial loading is not as critical as it is with posterior implant restorations. Implant position is critical to the final esthetic outcome, which must be considered in all three dimensions and in relation to the adjacent teeth.

What is usually strived for is to have the platform of the implant 3 to 5 mm apical to the cementoenamel junction of the intended replacement restoration and to have the implant as far to the labial as possible. This allows a smooth transition of contours from the narrow cross section of the implant to the natural contours of the replacement tooth6,7 (Figures 7 and 8).

With multiunit restorations, the mesiodistal positions of the implants are also critical -- errors resulting in interproximal placement of implants are difficult to manage esthetically (Figures 9 and 10).

It also must be noted that it is easier to control the esthetic outcome of the pontic area compared to an implant site in the cervical area -- use of too many implants may compromise the esthetic outcome of the restoration.

Figures 11 and 12 illustrate an implant

Figure 7. Anterior view illustrating ideal depth of implant in relation to restoration (note smooth transition in contours).

Figure 8. Sagittal view illustrating smooth transition from implant to labial surface with proper implant placement.

Figure 9. Illustrates implants placed in interproximal area with surgical guide in place.

Figure 10. Restoration with implant positions in Figure 9 with non-ideal esthetics.

Figure 11. Occlusal view of four implants placed to restore teeth Nos. 7 through 10 (note reverse arch form of implants).

Figure 12. Labial view of restoration of implants in Figure 11 -- note poor relation of mucosal margins.

restoration with implants in the Nos. 7, 8, 9 and 10 positions. This restoration does not require four implants to support it. A more esthetic result would have been possible without the implants placed in the Nos. 8 and 9 positions. Figures 13 and 14 show a fixed partial denture on implants in the Nos. 7 and 10 positions with Nos. 8 and 9 as pontics.

In addition, the depth of the more deeply placed implant will dictate the depth of the other implants placed, taking into account the final mucosal margins desired. **Figure 1**5 illustrates uneven depths of implant placement for Nos. 7 and 10 resulting in uneven clinical crown lengths of Nos. 7 and 10.

Timing of Implant Placement and Site Development

If the tooth to be replaced has not yet been removed, several determinations should be made prior to the extraction. The bone surrounding the root should be evaluated; and, if it is deemed deficient, a decision must be made as to how the implant site can be improved. This can be done by orthodontic extrusion of the root fragment before extraction and/or bone grafts. Immediate placement of the implant should be attempted if the anatomical conditions are conducive; this is the most predictable method of preventing collapse of the buccal plate.6-9

Soft-Tissue Manipulation During Restoration

Assuming that the osseous anatomy is adequate to house the implant in an ideal position as described above and the soft tissue is of adequate quantity, then an excellent esthetic result is often possible with a little more effort on the part of the restorative dentist. The restorative dentist can shape and form the peri-implant soft tissue with provisional restorations to create the proper exit profile of the replacement teeth. The cross-section of the implant is only 4 mm in diameter, and the restorative dentist can use the provisional restoration to transition this to the more natural contours that will be required. The provisional restoration can likewise be used to form the pontic areas (Figures 16 and 17). This information must be communicated to the dental technician, who is a vital part of the team.10-12 The provisional restoration can be used as an impression device to transfer the shape and form of the soft tissue to the technician to allow the definitive restoration to be formed like the provisional restorations13,14 (Figures 18 through 20).

Conclusion

When a patient has a missing anterior tooth and desires replacement, a decision must be made by the dentist and patient as to the method of replacement. Common choices would include a conventional fixed partial denture, a resin-bonded fixed partial denture, or

Figure 13. Occlusal view of implant restoration from Nos. 7 through 10 with implants in Nos. 7 and 10 area

Figure 14. Anterior view of restoration in Figure 13 -- Nos. 8 and 9 are pontics, control of esthetics is easier with pontics than implants.

Figure 15. Anterior view of implant-supported restoration from No. 7 through No. 10 with implants in Nos. 7 and 10 (note asymmetry of Nos. 7 and 10 due to uneven implant depth).

Figure 16. Provisional restoration for implant-supported restoration from No. 7 though No. 10.

Figure 17. Soft-tissue morphology with provisional restoration in Figure 16 removed.

an implant-borne restoration. Each has its advantages and disadvantages. The conventional fixed partial denture has the advantages of being an established treatment procedure, having predictable esthetics, and being expedient. It has the disadvantage of requiring preparation of adjacent teeth and potential risk for periodontal and pulpal tissue. The resin-bonded partial denture has the advantages of preserving tooth structure, having predictable esthetics, and having reduced cost. It has the disadvantages of being technique-sensitive for the dentist and technician and often losing retention. The implant-supported restoration has the advantage of preserving tooth structure of adjacent teeth, being retrievable, having documented success in the long term, and allowing shorter spans of restorations. It has the disadvantages of having a long treatment time, requiring a provisional restoration during implant integration, requiring surgical placement of the implant, requiring a provisional after the implant is uncovered, and having higher cost.

Even with all the disadvantages listed, the implant-supported restoration can be successfully executed when all the factors discussed in this article are addressed. When one or more of the adjacent teeth are unrestored or in need of only a minor restoration, when a long-span fixed partial denture can be avoided, and when the abutment teeth are compromised and cannot support pontics, the implant-supported restoration should be considered the restoration of choice.

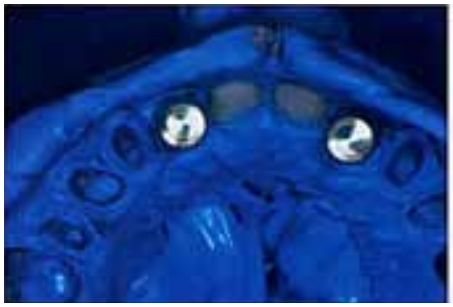

Figure 18. Provisional restoration "picked up" as impression coping in impression tray.

Figure 19. The soft-tissue morphology developed by the provisional restoration in Figure 16 is communicated to the dental laboratory.

Figure 20. Labial view of completed restoration.

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The Role of All-Ceramic Crowns in Contemporary Restorative Dentistry

TERRY E. DONOVAN, DDS, AND GEORGE C. CHO, DDS

ABSTRACT A large number of all-ceramic alternatives to metal-ceramic restorations are being marketed aggressively to the dental profession. Most of these all-ceramic alternatives have little or no scientific evidence to support their use. This article present guidelines for clinicians to analyze new ceramic systems and specific indications and contraindications for use. It is suggested that before practitioners consider using an extensively using an all-ceramic system, they make sure that published clinical trials document a survival rate of at least 95 percent over five years. In addition, each system should be evaluated to determine whether it delivers the esthetic results anticipated.

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The past decade has seen an unprecedented introduction of myriad all-ceramic crown systems. The introduction of many of these systems has been accompanied by an equally unprecedented blizzard of marketing activity proclaiming the benefits of these restorations. At most major dental meetings, superb clinicians dazzle their audiences with slides of beautiful all-ceramic restorations that rival nature in appearance and restore the smiles of their grateful patients.

The result of these converging activities is that the practicing dentist is often confused by the countless claims and counterclaims of various laboratories, manufacturers, and clinicians. This article has been written in an attempt to sort out fact from fiction in the area of all-ceramic restorations and to provide a philosophical matrix to assist clinicians in their choices for esthetic crown restorations.

It is important to understand that metal-ceramic crowns continue to be the gold standard for complete-coverage restorations. With proper tooth preparation, margin geometry and soft-tissue management, extremely esthetic and functional restorations can be fabricated; and these restorations will provide the best longevity of the esthetic alternatives.1-7 With the use of full-contour wax patterns with controlled cut-back techniques and proper alloy selection, the fracture rate can be close to zero. The use of porcelain labial margins using any one of a variety of techniques will ensure excellent esthetics in the cervical area.8-14 The authors prefer to terminate the metal on the labial or buccal surface about 1 mm from the shoulder margin to permit improved light transmission without compromising strength.15 Although some authorities recommend the use of 360 degree porcelain margins, in the authors' opinion this creates unnecessary complexity in the laboratory phase while providing minimal improvements in esthetics.

Figure 1 and 2. The fracture rate of all-ceramic crowns increases when they are placed on molar teeth.

Figure 3A and B. All-ceramic preparations optimally remove 1.5 mm of tooth structure circumferentially around the tooth.

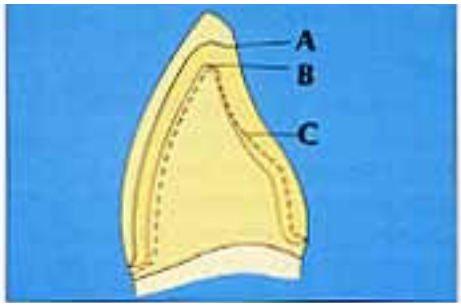

Figure 4. This diagram illustrates the primary differences between preparations for veneers, and metal-ceramic and all-ceramic crowns. All-ceramic crowns require greater reduction on the lingual and proximal surfaces. A = veneer reduction. B = metal-ceramic reduction. C = all-ceramic reduction.

The primary rationale for use of an all-ceramic crown is improved esthetic potential. Given that the potential longevity of all-ceramic crowns is generally less than that of metal-ceramic crowns, the former should be utilized only in those situations where the esthetic result is paramount. The need for exceptional esthetics on molars is rare for the majority of patients; and, because the failure rate is significantly higher on posterior teeth, it would seem prudent to limit use of all-ceramic crowns to anterior teeth (Figures 1 and 2). It is appalling to see complete arch all-ceramic restorations in trade journals done in the pecuniary pursuit of "metal-free" dentistry.16 Many of the posterior teeth in some of these articles either do not require restoration or could optimally be restored with a partial veneer restoration without any effect on the esthetic result.

Thus, the primary indication for all-ceramic crowns is single-unit restorations on anterior teeth and first premolars. Fixed partial dentures should not be fabricated with current all-ceramic systems.17 It is technically possible to fabricate all-ceramic fixed partial dentures with many systems, but it appears that the failure rate is relatively high with all of them. If a patient insists on a metal-free fixed partial denture, the clinician should provide that service only if the patient assumes total responsibility should the restoration fail soon after placement. One large dental laboratory reported a 75 percent failure rate of Empress II three-unit fixed partial dentures (Ivoclar North America, Amherst, N.Y.) at three years (Personal communication, David Avery, Drake Dental Laboratory, Charlotte, N.C., June 2002). This material was marketed extensively on its introduction as a material suitable for fixed partial dentures. Recently introduced zirconia-based materials have impressive physical properties, but the reader is cautioned that until controlled clinical trials are conducted, it is impossible to know if those improved physical properties will translate into improved clinical performance.18-20

All-ceramic crowns have the important advantage of potential to provide improved esthetics, but they have several disadvantages compared to metal-ceramic crowns. These include reduced marginal integrity, more-aggressive tooth preparation, potential wear of the opposing dentition, increased technique-sensitivity, and difficulty in dealing with a tooth preparation that varies significantly from the ideal.7

Acceptable marginal integrity can be achieved with most all-ceramic systems and with ceramic margins on metal-ceramic crowns. In spite of manufacturer's claims of superior marginal integrity with specific all-ceramic systems, several studies have concluded that better fit is obtained with metal margins.21- 24 In spite of their initial promise, most machined margins using various CAD/CAM technologies have not yet provided the superb marginal integrity anticipated. Although much has been written regarding marginal integrity with various systems, it should be noted that it has never been demonstrated that the differences seen in marginal integrity are clinically significant.

Although it is not commonly understood, all-ceramic tooth preparations are more aggressive than their metal-ceramic counterparts. While there is not universal

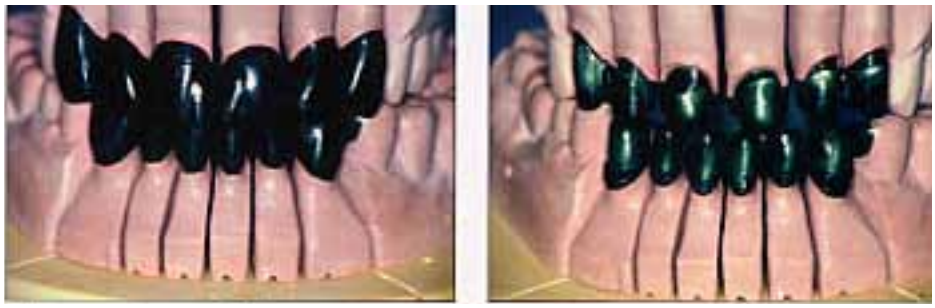

Figure 5. Use of a full-contour wax-up with a controlled cut-back technique ensures optimal metal support for the ceramic veneer with metal-ceramic restorations.

Figure 6 and 7. These teeth demonstrate excessive wear resulting from gliding contact with porcelain restorations on the opposing teeth.

Figure 8. With metal-ceramic restorations, centric and excursive contacts can often be placed on metal, thus minimizing the risk for excess wear.

consensus on this issue, in the opinion of the authors, all-ceramic preparations should remove 1.5 mm of tooth structure circumferentially around the tooth, and 2 mm off the occlusal surface of posterior teeth to achieve maximum strength and optimal esthetics (Figures 3 and 4). With metal-ceramic crowns, slightly less reduction is required on the labial or buccal surfaces and significantly less reduction can be accomplished interproximally and on the lingual surfaces. Some manufacturers of all-ceramic systems claim that 1 mm of reduction is adequate, and clearly crowns can be fabricated with such minimal reduction. However, these crowns never meet the optimal esthetic potential that can be achieved with the more aggressive reduction; and it is likely that the strength of the restoration is compromised as well.

One significant disadvantage of all-ceramic crowns is the inability to provide adequate support with non-ideal preparations. With metal-ceramic crowns, a full-contour wax pattern followed by a controlled cut-back technique will provide optimal support for the ceramic veneer, independent of the underlying preparation (Figure 5). Use of this technique also results in predictable esthetics; and, because a uniform layer of porcelain is created, minimal stress is generated at the porcelain/metal interface during cooling of the restoration after firing. This results in improved metal-ceramic bonding. With all-ceramic crowns, the cores are generally milled to create a uniform thickness of about 0.4 mm that conforms to the basic shape of the preparation. Thus, if the preparation is less than ideal (which in the clinical setting is often the rule rather than the exception), optimal support of the veneering porcelain is not provided. Clinically, this often results in chipping of the ceramic veneer off of the internal core. Anecdotally, a rather high incidence of failures of this type has been reported with several of the milled alumina- and zirconia-based systems.

Clinicians have noted many cases in which ceramic crowns have caused excessive wear of opposing dentition (Figures 6 and 7). While wear is a complex phenomenon, and is obviously multifactorial, it is clear that ceramic materials have a greater potential to cause wear than metal. Many manufacturers have claimed that their specific brand of porcelain causes less wear than their competitor's products, but this has never been demonstrated by clinical data. Laboratory studies on wear are notoriously inadequate in predicting clinical performance and clinicians are cautioned to interpret such data with a healthy level of skepticism. Until good clinical data is available to the contrary, the prudent clinician should assume that when any ceramic material is in repetitive gliding contact with the opposing dentition, it has significant potential to cause pathologic wear. In this regard, metal-ceramic crowns have the obvious advantage that metal contact with the opposing dentition can be developed both in maximum intercuspation and throughout most of the lateral and protrusive excursions (Figure 8). This, of course, must be accomplished with considered use of the appropriate cut-back design.

Once it has been determined that all-ceramic crowns are indicated for a specific patient, a choice must be made among the myriad products available. The clinician should utilize a clear set of criteria to apply to assist in this decision.

Given that the primary indication for use of all-ceramic crowns is improved esthetics, the clinician should analyze available systems in terms of their ability to deliver on that promise. Many all-

ceramic systems achieve their improved strength characteristics by virtue of an internal opaque core. These systems will not provide any better esthetic result than that of metal-ceramic restorations and thus should be avoided. Additionally, to achieve maximum esthetic potential, color must be able to be developed internally to mimic tooth structure. With some systems, colorants are painted on the surface and little or no light transmission occurs. Again, the esthetic potential of these systems is limited; and these should also be avoided. Systems should be selected with core materials that permit light transmission and for which the basic color of the restoration is determined internally.

The second important criteria that should be applied when selecting an all-ceramic crown system is that it should be supported by appropriate scientific evidence. Laboratory studies conducted to determine the physical properties or strength of all-ceramic crowns have virtually no value in predicting clinical performance.25-28 All-ceramic crowns fail by propagation of microscopic defects called Griffith's flaws, or defects created during fabrication or adjustment.29-30 Such defects undergo static fatigue and stress-corrosion in a moist environment, and crack propagation can occur in the absence of excess occlusal stress.31 These facts mandate that manufacturers provide evidence from properly conducted clinical trials before materials are used routinely. It has been suggested that a minimum length of such clinical trials be three years and optimally five years and that the failure rate be no higher than 5 percent.32-33

Based on the preceding discussion, it would seem that the system that best meets these criteria and possesses the strongest evidence base at the time of this writing is the IPS Empress system (Ivoclar North America, Amherst, NY).34 The translucent internal pressed core with this system combines adequate strength characteristics with improved light transmission. Several clinical trials have demonstrated good clinical performance in the short term.35-36 Other systems worth considering are the ProCera AllCeram crown (NobelBiocare USA, Yorba Linda, Calif.) and Inceram Alumina (Vident, Monrovia, Calif.).37-39

Although a limited number of clinical trials have been published in recent years, it is a basic fact that such data is not available to the clinician until many years after a system is introduced to the profession. Clinicians wishing to utilize new systems in the absence of clinical data should proceed with caution. Systems should be analyzed in terms of their ability to provide improved esthetics and their potential for longevity. Experts in the field should be consulted, and a thorough knowledge of the system requirements (preparation design, requirements for bulk reduction, margin geometry, etc.) should be obtained from the manufacturer. It would seem prudent to then use the system (with the appropriate informed consent) in a few patients and then to observe the results before placing large numbers of such restorations. Placing large numbers of essentially experimental restorations is unfair to patients and potentially very expensive for the clinician.

Conclusion

All-ceramic crowns have one advantage and numerous disadvantages. With some systems, crowns can be fabricated that demonstrate superior esthetics to that achieved with metal-ceramic crowns. However, in general, the life span of all-ceramic crowns is shorter, the fit is inferior, tooth preparation is more invasive, and cementation is more difficult. All-ceramic crowns should not be used with less than ideal preparations and may cause excessive wear of opposing tooth structure in some patients.

Thus, the use of all-ceramic crowns should be limited to those situations in which esthetics is of primary importance. They are contraindicated on molars and for fixed partial dentures. All-ceramic systems should be selected on their ability to provide superior esthetics and on the results of controlled clinical trials. It is suggested that a survival rate of 95 percent or better after five years would be necessary to demonstrate success. Using these criteria, IPS Empress (Ivoclar North America, Amherst, N.Y.) would be the current system of choice for use when all-ceramic crowns are indicated.

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Ethically Compromised

To dentists submerged in teeth all their professional lives, a tooth is a tooth, is a tooth.

Robert E. Horseman, DDS

It's been a bad day. Once again, you're questioning your mental state back 15 or 20 years ago when you first decided to become a dentist. The "grass is greener" syndrome begins early and outlasts your hair and your figure.

You know you have little or no talent for dropping balls in cups or hoops or contacting them with bats. You realize that you have no apparent skills as a thespian, even though this is not a requirement for recognition. You can sort of carry a tune and can detect a beat if there is one, but could never humiliate yourself performing an original piece, even though you can play a guitar as badly as the current crop of strangely coifed adolescents.

What's the problem, then? It's the money, right? The obscene salaries paid to these high school dropout game players, these scenery-chewing hams majoring in pretense, these tone-deaf, lyric-deficient defilers of "real" music – that's what's sticking in your craw.

Admit it, you wet-gloved, appointment-driven, HIPAA-confused masked denizen of the 8 x 10 operatory. Now, repeat, "Life Is Not Fair."

But see that pinpoint of light at the end of the tunnel? There is a Way Out wherein you can capitalize on your meager assets without having to learn anything new. Well, maybe this one thing:

When I was young, my father drove a 1937 Plymouth four-door sedan, colored brown. It was the most embarrassing car a 17-year-old kid could be seen in other than a Nash Rambler. Each September in those days, Ford, Chevy and Chrysler made a big whoop comparable to the Second Coming out of announcing their new models. Searchlights fingered the skies, and the populace flocked to dealers' showrooms to gape at acres of chrome and tail fins more suitable for a Boeing 747. It was an annual rite we wouldn't have missed for anything despite the fact that my father never bought a car there. He believed that only suckers paid full freight when the inevitable depreciation was just around the corner.

Sometime during the next decade, car manufacturers suddenly twigged to the fact that with this much interest in new cars, "Why don't we – like Judy Garland and Mickey Rooney – PUT ON A SHOW! Charge $10 to get into it, and they will come!" And they did. Not Judy and Mickey, but the salivating public who saw nothing wrong with paying to queue up and swoon over that new car smell. Thus was born the concept of "We want desperately to unload these machines, so we will charge you money to come and be given the chance to buy one."

So now it's your turn, Doctor. St. Appolonia Pharmaceuticals wants the dental population to embrace its new posterior composite One-Step All-Purpose Deluxe Superior F-91. F-91 is the revolutionary improvement over its predecessor, the One-Step All-Purpose Superior F-90 and thus warrants the "Deluxe" appendage.

Apollonia's own labs, staffed by skilled technicians and supervised by the Head of Marketing to ensure no bias, have determined that the new composite is "10 times more resistant to coffee (instant) stains than other leading brands." Further, the caries-inhibiting ability of OADSF-91 when tested on in-vitro chicken beaks has been clinically proven to be more ef-

ficacious than similar testing on rats fed Krispy Kreme Doughnuts by other leading composite manufacturers.

Apollonia is on a roll, and it wants to put on its version of a show to acquaint dentists with the obvious advantages of the new, improved product. Of course, there will be a fee! What's good for General Motors is good for the country, a proven fact.

Here's where you come in, Doctor. Apollonia Pharmaceuticals will ante up to $150,000 per annum, offer the use of the company Lear or, if the CEO isn't using it, the Citation III to jet between shows. You may be accompanied by one (1) Significant Other and will be put up at five-star hostelries. Best of all, you don't have to use or even like the product, although that would be a plus. All you have to say is that "in your hands" this is the best thing that's come down the pike since the last one. Is that too much to ask? Apollonia thinks not.

Only one thing: You have to be a recognized authority, a clinician with some chops, or, at the very least, photograph in such a way that you look like somebody who knows what he's talking about. That's your problem and you'd best hop to it; the field is getting crowded already.

Unethical, you muse? Is George Foreman unethical? Michael Jordan, Joan Rivers, Jason Alexander, Tatum O'Neal, Cal Worthington and his dog Spot? Maybe the grass IS greener. Knock off those cheesy Yellow Page ads; we're professionals here – Apollonia is waiting impatiently because One-Step All-Purpose Deluxe Superior Quintessential F-92 is already on the boards.