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Fall 2015

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Artistry meets technology
New digital systems

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Thanks to technology, I can take care of pretty much anything over coffee. New blouse for work? Check. Sushi for dinner? Check. Follow my sister through Italy? Check. Turns out that's nothing compared to what's going on in dentistry, though. When I needed an implant, I was referred to a prosthodontist. The digital technology in her office meant that treatment took less time, cost less, and left my smile looking better than ever. Flowers to say thanks? Check.

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Display Advertising

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The *ACP Messenger* (ISSN # 0736-346X) is published four times per year in the winter, spring, summer, and fall by the American College of Prosthodontists:

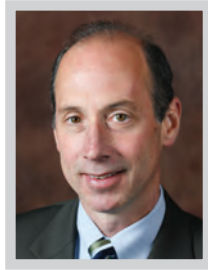
211 E. Chicago Ave., Suite 1000, Chicago, IL 60611
Phone: (312) 573-1260; Fax: (312) 573-1257
Email: acp@prosthodontics.org
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Stephen Balshi, MBE is the President of CM Prosthetics Inc., a laboratory that focuses on the rehabilitation of the fully edentulous, utilizing state-of-the-art CAD/CAM technology. He is also the Director of Research at the Institute for Facial Esthetics.
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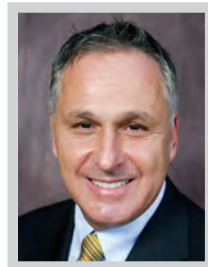
Dr. Lyndon Cooper is the Stallings Distinguished Professor of Dentistry of the Department of Prosthodontics at the University of North Carolina at Chapel Hill. He is Chair of the ACP Education Foundation as well as the Editor Emeritus of the *ACP Messenger*.
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Dr. David Guichet is a member of the ACP Board of Directors. He maintains a private practice in Orange County, California.
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Dr. Mathew Kattadiyil is Professor and Director of the Advanced Specialty Education Program in Prosthodontics at Loma Linda University School of Dentistry, and Editor-in-Chief of the *ACP Messenger*.
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Dr. Frank Tuminelli is President of the ACP and Program Director at New York Hospital Queens, Department of Graduate Prosthodontics.
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Dr. Thomas Maveli completed his surgical prosthodontics specialization training through a dual-major advanced dental education program in Prosthodontics and Implant Dentistry at Loma Linda University, where he was the recipient of the Nobel Biocare Scholar Award.
▶ Page 8

Correction

In the Summer issue of the *ACP Messenger*, a photo of The Ohio State University resident Dr. Paola Saponaro was mislabeled as being from Texas instead of Ohio. We regret the error. Along with federal services support, Dr. Saponaro participated in providing a free denture program during NPAW alongside Dr. Valerie Cooper and other residents from OSU. They completed free dentures for five patients.

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A time for change and collaboration

Mathew T. Kattadiyil,
DDS, MDS, MS, FACP
ACP Messenger Editor-in-Chief

Our specialty stands to benefit from the recent modifications to the Standards for Prosthodontic Education adopted by the Commission on Dental Accreditation. The leadership of the American College of Prosthodontists past and present should be recognized for their vision, dedication, passion, and persistence in proposing the revisions and seeing it through to fruition.

This gives us an opportunity to celebrate, reflect on strategy, and plan for the future.

Standard 4-22 now states:

Students/Residents must be competent in the placement, and restoration of dental implants, including referral.

While we in the education community are excited by this change that requires our graduate students to gain competency in implant placement, we also recognize the need to continue to collaborate with surgical specialties. The inclusion of the word “referral” implies sound decision-making as to when to treat or refer a patient for surgical procedures. Criteria should be developed with interdisciplinary and interdepartmental collaboration, recognizing the needs and demands of each specialty, focusing on the best possible outcomes for the patient as the primary goal.

Standard 4-25 has also been modified and now states:

Students/Residents must be competent in laboratory procedures used in the treatment of edentulous, partially edentulous and dentate patients.

Intent: Students/Residents should be able to use existing technologies to plan, design and fabricate prostheses. They should be capable of directing dental technicians in prosthodontic laboratory procedures. They should be able to evaluate newly introduced technologies and apply these as appropriate.

I see this as a clear mandate to increase our focus on digital dentistry. These new standards are scheduled for implementation in July 2016. With the explosion of digital applications in dentistry, we have to focus on providing infrastructure for digital technology, both clinical and laboratory-based, that enables our students to enter clinical practice as leaders in this field, adept in the digital planning, designing, and fabrication of restorations.

This issue of the *Messenger* was created with keeping the new standards in mind. Dr. Thomas Maveli provides a patient presentation where he performed both surgical and prosthodontic procedures during his training. In advance of the 2016 Digital Dentistry Symposium, Dr. David Guichet illustrates the point where artistry meets technology with a close-up look at the techniques used in a complex rehabilitation. Mr. Stephen Balshi shares new developments from dental laboratories managing on managing wear factors for the fixed complete denture incorporating



digital technology. And three innovators in the dental industry describe their latest digital systems and the benefits those systems offer to patients and practitioners alike.

The revisions to these standards will require significant collaboration amongst graduate programs and administrations in each school all over the country for successful implementation to the prosthodontic curriculums. The changes will have an impact on the board certification process as well, and I am sure that requirements will evolve to reflect the new standards. I am also sure that these new standards, in the spirit upon which our specialty was founded, will enable us to deliver the very best in care for the patients we serve. ■

A retirement smile makeover

Thomas C. Maveli,
DDS, MS, FACP

Retirement can be an opportunity to get out of the rat-race and take time for yourself for a change. As some people enter this phase of life, they find that their teeth and dental work aren't doing as well as they could be.

In the past, dental health took second place to other “more important” matters, but when retirement comes around, people have the opportunity to re-evaluate their dental needs. This was the case for Donna, who came to the Advanced Specialty Education Program in the Prosthodontics Department at Loma Linda University School of Dentistry seeking treatment. She knew her teeth had looked “funny” for quite some time and her partial dentures had seen better days. (Figure 1) She also knew that if she wanted to stay healthy, part of that would depend on being able to chew her food better. She had been regularly seeing a dentist, but wanted to know what more could be done for her teeth other than just getting new partials. That was when she heard from a friend what a prosthodontist could do for her.



Fig. 1. The patient's smile before treatment. Her upper teeth were tilted to one side and her partial dentures were worn and discolored.



At the Prosthodontics Department, Donna's dental condition was carefully evaluated. Her teeth looked "funny" because they were tilted to one side (Figure 2) and her partial dentures were very worn down. She was given a comprehensive treatment plan for a new smile. The appearance of her teeth would be improved with new crowns on her upper teeth. Her chewing ability would be improved by using dental implants to replace her upper back teeth and eliminate the need for an upper partial denture. (Figure 3)

Bone grafts were necessary to build up the bone for implants to be placed. Five implants were placed in the back of the upper jaw. One implant was placed in the back of the lower jaw as an anchor for a new lower partial denture. This would eliminate the 'rocking' she had experienced with her previous partial dentures.

While the implants were healing, temporary upper and lower partial dentures were placed so that Donna could continue to function. Later, temporary crowns were placed on the teeth and implants to give Donna an idea of how the new teeth would look and function. (Figure 4) This gave the patient the opportunity to



Fig. 2. An intra-oral view of the patient's smile before treatment.

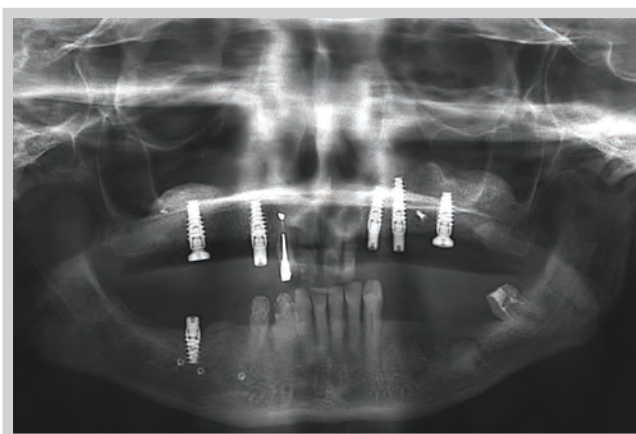


Fig. 3. A radiograph showing placement of five implants in the upper jaw to replace the back teeth and one implant in the lower jaw to assist retaining a lower partial denture.



Fig. 4. The temporary restorations that allow the patient to evaluate her new smile.



Fig. 5. The definitive crowns and implant-supported lower partial denture.



Fig. 6. An implant was placed in the back of the lower jaw with a Locator attachment that connects to the partial denture. The implant and two crowns aid in stabilizing the partial denture.

assess her new 'look' and suggest areas that needed to be improved in her new smile. Once Donna was happy with her temporary crowns, definitive crowns were fabricated using the final version of the temporary crowns as a guide and placed on all the upper teeth and implants. New crowns were also placed on two lower teeth; these crowns were designed with special features to aid the lower partial denture. (Figure 5) The implant in the lower jaw also helped stabilize the lower partial denture by using an attachment that connects the partial to the implant. (Figure 6)

After placement of the definitive prostheses, Donna now enjoys an improved appearance of her smile and is able to eat better. (Figures 7 & 8) She has renewed self-confidence and is ready to enjoy retirement with her new smile. ■



Fig. 7. The patient's smile before treatment.



Fig. 8. The patient's new smile after treatment.

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Digitally enhanced dentistry: artistry meets technology

David Guichet,
DDS, FACP

The manner in which dental restorations are planned, designed, and fabricated has changed tremendously. The prosthodontic/restorative team routinely utilizes computer technology from the initial diagnosis to the placement of restorations in the delivery of oral care.

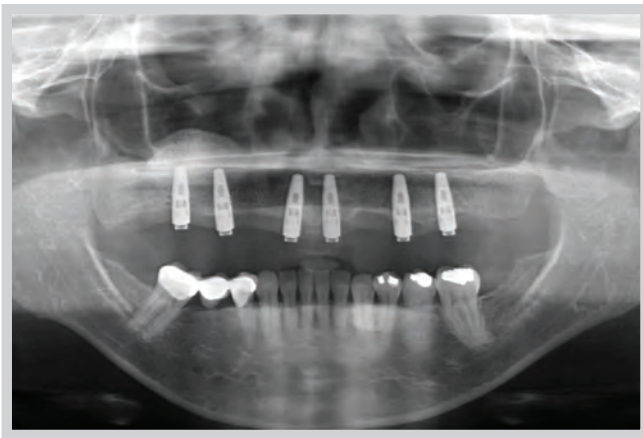


Fig. 1. Panoramic radiographic view of the pretreatment condition.



Fig. 2. Occlusal view of preexisting overdenture abutments

Advances in computing capabilities, together with 3D diagnostic imaging and computer-assisted design and manufacturing (CAD/CAM), have contributed significantly to this trend.

A 3D work environment, combined with cone beam computerized tomography (CBCT) technology and implant treatment planning software, allows planning of implant surgeries and fabrication of surgical guides. The process has been further enhanced with the introduction of chairside optical scanners, laboratory optical scanners, restoration design software, and precision printing and milling processes. Simultaneously, advances in material technology have created a new generation of robust and esthetic millable materials for restorations.

This article demonstrates the utilization of digital technology in combination with the artistry of dental technology to create esthetic outcomes in a patient situation needing complex rehabilitation (Figure 1).

The patient presented with a fractured over-denture resting on multiple retentive abutments (Figure 2). Definitive impressions were made and casts mounted at the desired occlusal vertical dimension in centric relation. The cast data was then optically scanned in the laboratory into the design station.

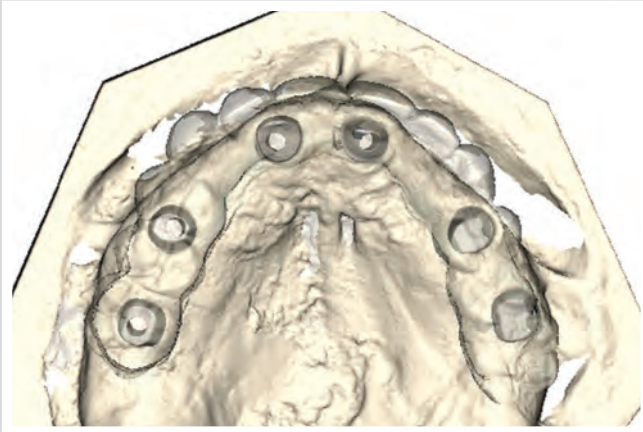


Fig. 3. Design file of provisional restoration overlying proposed abutments.

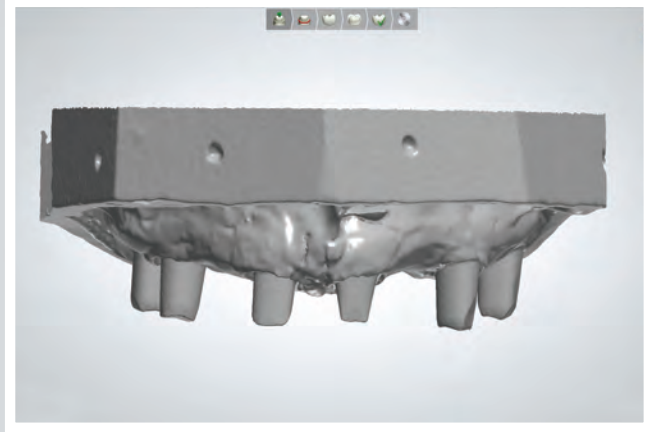


Fig. 4. The CAD/CAM abutments were assembled onto the master cast and scanned.

CAD/CAM Abutment Design

Utilizing a laboratory based optical scanner, design software (3Shape Dental System), and CAD/CAM implant position indicators (Atlantis, DENTSPLY Implants), the laboratory team worked together to scan, design, edit, and approve CAD/CAM abutments for manufacturing. The abutment design and manufacture process requires a full contour wax pattern which is then cut back before fabrication. Simultaneously full-contour CAD/CAM acrylic provisional PMMA restorations were created to adapt the new abutments as seen in the transparency (Figures 3 & 4).

CAD/CAM Provisional Restoration Design

Effective communication with dental laboratories is critical in achieving the intended outcomes. Technicians who are familiar with the design software can activate/initiate online collaboration and communication tools to easily review the design with the prosthodontist. The scanner accuracy is proven in university research and the anatomical teeth libraries provide a wide selection to allow customization.

With some software manipulation, virtual teeth can be arranged quickly and efficiently with detailed and appropriate anatomy. Modifications to the form and position of the teeth can be made with relative ease compared with traditional physical lab techniques using wax patterns. It should be noted that precise modification of the digital forms appears easy but can present its own challenges requiring the talents of a skilled and experienced laboratory technician. The planned collaborative result can be compared to the patient's pretreatment casts and also to the patient's provisional restoration through multiple overlay scans and transparency tools. Once the CAD (computer aided design) is complete, a full contour design file is exported to the mill for manufacturing. This file contains information regarding the shape of the proposed design, a process known as CAM (computer aided manufacture).

The CAD/CAM provisional restorations are worn by the patient and modified until proven acceptable. The provisional restoration can be used to develop ideal framework design, occlusal vertical dimension, prosthesis profile, and occlusal scheme. The provisional restoration also allows the patient to evaluate and accept the esthetics, as well as to get comfortable cleaning and using the restoration.

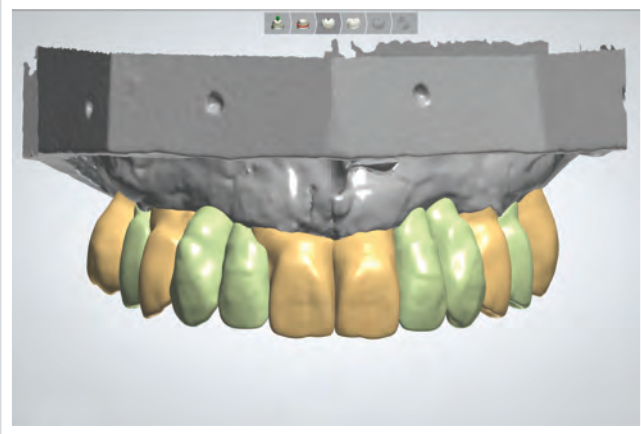


Fig. 5. Facial view of the full contour digital wax-up prior to digital cutback.



Fig. 6. Final digital restorative design. Facial view with 0.8mm digital cutback for porcelain.

CAD/CAM Definitive Restoration Design

Once the requirements of the provisional restoration have been confirmed, the CAD/CAM provisional serves as a guide or “prototype” for the final crowns and bridges. Once the final position of the anatomical crowns is established, an “Anatomy Cutback Design” can be selected in the design software to position high strength zirconia in areas of high stress and make room for the highly esthetic veneering feldspathic porcelain overlay (Figure 5). The data file can be digitally “cut back” to allow for the addition of veneering porcelain (Figure 6).

Once editing is complete the file can be exported in this new cutback form to the CAM software and to the mill for production. In the patient situation illustrated here, the restorative design incorporates all inter proximal and occlusal contacts in high

strength zirconia (Prettau®, Zirkonzahn). A digital facial cutback of precisely 0.8mm is used for the veneering porcelain in areas where stresses are low and esthetic demands are high (VM9, Vita).

CAD/CAM software programs offer a variety of tooth forms selected from a tooth library. Many programs allow users to scan and import their own tooth libraries from either casts of natural teeth or optimized wax-ups. The virtual tooth forms can be positioned in the dental arch, adapted to the tooth preparations, and sculpted into nearly finished restoration designs.

Unlike the traditional methods requiring excessive veneering porcelain, a new generation of esthetic high strength materials can be converted from CAD/CAM designs into milled restorations with full contour zirconia or minimally veneered designs with little risk of chipping (Figure 7 & 8).

CAD/CAM Restoration Material

This patient’s restoration was milled from zirconia ceramic material which provided a good marginal fit. Following initial manufacturing, the material can be color characterized prior to sintering (a heat treatment to impart strength and integrity) as



Fig. 7. Maxillary arch with custom CAD/CAM abutments in place



Fig. 8. The restoration with both internal and external characterization.

well as surface characterized after sintering. The need for the traditional steps of porcelain opaque and porcelain build up with multiple baking cycles is nearly eliminated with the CAD/CAM milled zirconia (Figure 9 & 10).

A variety of laboratory design modifications have been introduced to validate the restorative design concept illustrated in this patient treatment.

These modifications have been used exclusively for over 1200 restorations in our practice with up to a three year follow-up. There have been two restorative unit fractures of veneering porcelain resulting in remake during that time. Other authors have reported similarly favorable results.

Today, dentists utilize digital processes with the aid of dental design software, including multiple merged diagnostic data sets, linked digital design, and manufacturing workflows for more accurate and efficient planning and treatment.

Patients treated with digital dentistry solutions benefit from the combination of efficient processes, accurate high strength materials, and beautiful esthetics. Fundamental to this process is a well-conceived plan that is specifically designed to meet the treatment needs of the patient. ■



Fig. 9. Intraoral view of the maxillary milled zirconia prosthesis



Fig. 10. Lateral view of the patient revealing a relaxed semi-smiling tooth display.

The Power of Digital Design

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Life expectancy of the fixed complete denture

Stephen F. Balshi,
MBE

Patient education regarding prosthetic maintenance needs and timelines comes from years of collaboration between prosthodontists and dental laboratory technicians.



Fig. 1. Occlusal view of mandibular fixed complete denture following 9 years of function.



Fig. 2. Occlusal view of retreaded mandibular fixed complete denture shown in Figure 1.

Screw-retained complete-arch dental implant rehabilitations have existed as a treatment option for the completely edentulous patient for over 50 years. From the beginning, Professor Per-Ingvar Brånemark restored his patients with a fixed complete denture. This prosthesis consisted of manufacturer's denture teeth processed to a cast metal framework with acrylic resin. In today's marketplace, there are many different options for restoring a complete-arch of dental implants, including various ceramic materials. However, with the All-on-4® treatment concept becoming so popular over the last few years as an economic and convenient solution, the screw-retained acrylic-veneered fixed complete denture continues to be one of the more popular solutions as a definitive prosthesis.

While the implant-supported acrylic-veneered fixed complete denture is a good option for the completely edentulous patient, it does require maintenance and can also experience prosthetic complications. Denture tooth fracture and/or debonding from the acrylic resin base are probably the most common complications experienced with these restorations. Patients who function with an implant-supported acrylic fixed complete denture will experience occlusal wear to the denture teeth over time. This is a built-in buffer to a rigid system that works quite favorably from a biomechanics standpoint. However, as the teeth wear, patients experience alteration of their occlusion (bite), guidance in excursive or side-to-side jaw movements, and the loss of occlusal vertical dimension.

The dental laboratory process to replace the worn teeth and acrylic resin base is called a “retread”. In a manuscript authored by Balshi et al and accepted for publication in the *International Journal of Prosthodontics*, a retread is defined as, “the removal of worn veneering material on an implant-supported framework followed by the replacement of new veneering material at a desired vertical dimension of occlusion on the same implant-supported framework.” After studying 205 arches, the authors reported that it takes an average of seven years for the patient to wear down acrylic denture teeth to the point at which they need replacement. An example of a worn implant-supported

fixed complete denture is illustrated in Figure 1. The same framework after the retread procedure in the dental laboratory is shown in Figure 2.

Recent innovations in digital dentistry have modified procedures associated with the fixed complete denture. The same retread procedure that we’ve been performing for years can now also be done as a fully milled acrylic resin veneer where there are no individual denture teeth. This is a “game-changer” for the fixed complete denture because it could dramatically reduce the number of prosthetic complications that are seen with this type of restoration.



Fig. 3a. Virtual tooth design for retreaded prosthesis from an occlusal view.



Fig. 3b. Virtual tooth design for retreaded prosthesis from a frontal view.



Fig. 3c. Virtual tooth design for retreaded prosthesis from a posterior view.

Once the desired vertical dimension of occlusion is established, it is optically scanned and a new digital tooth arrangement is made (Figures 3a-c). The technology can be applied to frameworks that are “wrap-around” style (Figure 4a-b) or cases that have polished metal on the intaglio (tissue) and/or lingual surfaces (Figure 5a-b). Early unpublished results show a complication rate less than one percent.

It is expected that the fully milled resin veneer will wear at the same rate or even a little slower than manufacturer’s denture teeth. In other words, the biomechanical “buffer” that exists with a traditional

fixed complete denture still exists with the fully milled acrylic resin denture. A digital record of the case is stored when the next retread procedure is needed in the future.

It is prudent for the clinicians to discuss wear factors and future need for retread procedures with patients at the initiation of implant prosthodontic treatment. It would be beneficial for this information to be included in the written informed consent for treatment. This patient education prior to treatment will inevitably avoid surprises and confrontations between the patient and the practitioner when retreats are required. ■



Fig. 4a. Fully milled retreaded titanium framework from an occlusal view.



Fig. 4b. Fully milled retreaded titanium framework from an intaglio view.



Fig. 5a. Fully milled retreaded cast gold framework with a polished intaglio surface from an occlusal view.



Fig. 5b. Fully milled retreaded cast gold framework with a polished intaglio surface from an intaglio view.

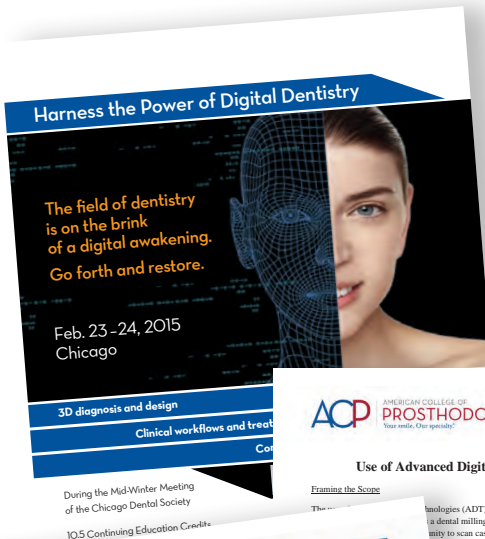
A look back and a look forward

Frank J. Tuminelli,
DMD, FACP
ACP President

It seems like it was just last night that I delivered my presidential acceptance speech. In that speech, a vision for the year was presented. It was full of hopes, goals, and the desire to add a small piece to the already proud heritage of our great College.



Educators meetings



Digital Dentistry Symposium and position statements



This year has been filled with accomplishments and milestones. The one foremost in all our minds is the new Standards for Prosthodontic Education. After a passionate and persuasive argument by Dr. Steve Campbell, our efforts culminated in approval of the new Standards by CODA on August 7th. This historic event has solidified the future of the specialty for the immediate and long term. We are positioned to become the leaders in material science and optimal care delivery. We have embraced collaborative efforts with other dental organizations, such as the Academy of General Dentistry, and we are being looked to as the source for the most current educational models.

The scope of the Standards is far reaching. With support from the ACP Board of Directors, a task force chaired by Dr. John Agar is already in high gear planning how to help the Program Directors with the successful implementation of the new Standards in July 2016. It is an exciting time.

In my address, I said that the specialty must begin the process of unburdening our future residents from crushing debt. The creation of the Task Force on GME funding, chaired by Dr. Len Kobren, has made monumental strides. An ACP leadership team met in Washington, D.C. with legal representatives. It appears there are pathways forward, ranging from utilizing the current GME framework to developing our own legislation with an eye to funding graduate education. The ACP Board will carefully review these options. This will ensure that we will continue to attract the best

and brightest, that our new residents will be accepted on merit and not financial ability.

We have opened discussion of utilizing the MATCH and PASS systems for the application process in our programs. After a pilot discussion with educators, it was concluded that this should be further explored. We will begin an in-depth consideration in October. The Program Directors will have the option to take formal action if they desire to. This would result in programs and residents being better aligned. More importantly the landscape will allow for fair and open evaluations and better choices on both sides. The Educators Meetings this year, under the direction of Dr. Leila Jangahri (predoctoral) and Dan Givan (postgraduate), and with Central Office support from Adam Reshan and Justinn McDaniel, have received numerous accolades.

Thanks to our Immediate Past President, Dr. Agar, we have brought forward a rich and diverse menu of position statements. They are in your membership directory and on the brand new ACP member website at Prosthodontics.org. Our talented membership has developed a library of pertinent topics. These will brand the ACP and prosthodontists as key opinion leaders in dentistry. We are currently developing more, and we look to you for continued input and comment.

In February, we held our first Digital Dentistry Symposium, where Program Chair Dr. David Guichet compiled a stellar program for a wildly oversubscribed audience. Attendees and our corporate partners delivered rave reviews. We will hold our second Digital Symposium in February 2016 with another masterful program. Register early!

The Central Office led by our executive director, Deal Chandler, has worked tirelessly to maintain all essential functions while going above and beyond to respond to member needs. With the scrupulous management of Deal and Jack Kanich, finance manager, the finances

of the College have never been in better condition.

Our exposure through the media has continued to grow. Prosthodontists are being quoted and interviewed, serving as information sources in diverse areas from treatment delivery models to choices in health care options. Our Central Office media team led by Carolyn Barth has placed us at the forefront as experts in the profession, and it is gaining momentum.

Then there is our upcoming Annual Session; our Program Chair, Dr. Jon Zamzok, has assembled a cadre of world-class speakers from around the globe. This is a thought-provoking and enlightening program that will leave you spellbound. Our associate executive director, Melissa Kabadian, has worked out all of the specifics and it promises to be a memorable experience for all of us.

Thanks to efforts of Nathalie Williams, the Sections have continued to evolve into dynamic hubs of our grassroots efforts. She has proven to be integral as a resource for identifying some of the most dedicated and rising stars in our membership. Her interaction with the Sections and the Section leadership has given us a window into the future.



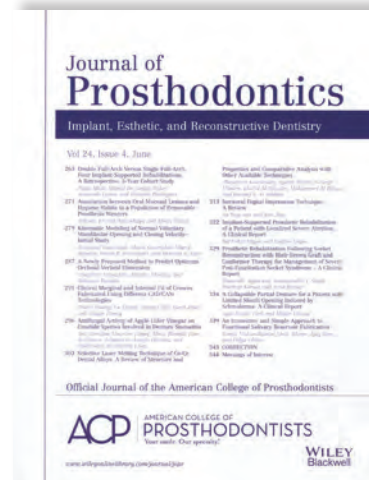
PublicRelations

The *Messenger* is a beautiful and informative publication that the College can be very proud of, under the careful and creative vision of our associate executive director, Mark Heiden, communications manager Lauren Swanson, and our editorial team of Dr. Mathew Kattadiyil, editor in chief, and associate editors Dr. Carl Driscoll (ACP President-Elect) and Dr. Susan Brackett (ACP Vice President). Our *Journal of Prosthodontics* continues to grow in renown thanks to Dr. David Felton, editor-in-chief, Dr. Radi Masri, associate editor, and Alethea Gerding, managing editor.

There have been so many other accomplishments this year; I hesitated to begin writing because I knew I could never thank everyone who deserves recognition for what they have done over the last year. To all of

you, I can only express my admiration for the talent and the commitment you have brought to the College and the specialty. It is thanks to you that I leave this office with a smile on my face, excited to see what is ahead.

It has been the greatest honor and privilege to serve as your president. This was a year of many steps – some small, some large, but all in a direction that will continue the ACP on its path as a specialty of leadership, as a specialty that defines the future of our profession. ■



November 6-7, 2015

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Embracing new technology: easier said than done

Lyndon F. Cooper,
DDS, PhD, FACP

We all have heard the classic proverb, “you can’t teach an old dog new tricks”.

Prosthodontics has for decades been characterized as the old guard, conservative branch of clinical dentistry.

Yet here we are in the summer of 2015 with a set of new educational standards that requires us to provide education regarding emerging technologies and dental implant surgery. Are we ready for the new academic semester and years to follow? Can we assure that the new technologies and skills will be rapidly adopted and transferred into our practices? Will our patients see the benefits our efforts have provided?

The ACP Education Foundation enjoys remarkable success in outreach to the community of students. Our residents benefit directly through legacy programs of research support, underwriting membership, and stipends to attend annual meetings of the College. Further indirect benefits are realized through our support of Educators/Mentors meetings and the surveys that measure the pulse of our advancing specialty. Now, faced with the luxury of improving our own educational standards, the ACP and the ACPEF will address new challenges raised by the high stakes game of emerging technology in digital dentistry and implant therapy. How will we manage?

An interesting report on the BBC discussed a phenomenon in business termed ‘reverse mentoring’ where executives are learning from tech-savvy millennials. They identify some of the challenges of reverse mentoring such as mentee intimidation, inappropriate leveraging of tech skills to mentors, and the observations that tech-savvy youth often lack



requisite social and business knowledge or etiquette. Despite the challenges, the message was clear. Today’s business world benefits from the rapidly acquired tech knowledge of its younger employees.

This brief report on reverse mentoring suggests that prosthodontics may have a similar opportunity at hand.

Should we choose to empower the youngest members of our specialty – our residents and recent graduates – we may benefit more broadly. The generosity of the ACPEF to our younger members and its support of the

transformation of the specialty that includes adoption of emerging technologies is among the healthiest actions organized prosthodontics can perform.

You may, when faced with the need (or, dare I say, responsibility) to learn all things digital dentistry, find yourself overwhelmed. My own experiences have involved those challenges, feelings of buyer’s remorse, and frustration. But just when I’m sure the old proverb is true, a bright and enthusiastic resident steps up and – through a process of reverse mentorship – provides that one suggestion or helping hand that proves new tricks can be learned by each of us.

Without additional support of the ACPEF, we established prosthodontists will never have the good fortune of being taught what we don’t yet know. ■



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CONTRIBUTOR AWARDS

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New digital systems for prosthodontists

Prosthodontists are on the leading edge of dentistry in the use of technology to benefit patients. For this article, three innovators in the dental industry were asked to describe their newest advances and the benefits they offer to patients and practitioners alike.

AvaDent Digital Removable Prosthetic Solutions

With one of the world's first suites of digital removable prosthetic solutions, AvaDent provides a complete solution for full mouth rehabilitation, including dentures, overdentures and fixed hybrid solutions for both maxillary and mandibular edentulous arches.

AvaDent® Monolithic Milled Teeth and Base: The entire denture — including base and teeth—is full-contour milled from a patented, pre-shrunk, bacteria-resistant, polychromatic, PMMA eXtreme Cross Linked (XCL) puck. This combines the bio-hygienic benefits and strength of the proprietary puck manufacturing process with the computer precision fit and algorithm-based occlusion of digital design and milling process to create a fully milled prosthesis where the base and teeth are one unit. (Figure 1)

There are two versions: the AvaDent XCL-1 is a single-layer denture with monochromatic teeth while the AvaDent XCL-2 features polychromatic teeth that simulate the dentin and enamel of natural teeth. (Figure 2)

Signature Teeth: Signature Teeth are computer designed and manufactured to produce a better outcome for the patient. It is now possible to digitally design denture teeth to meet the specific needs and desires of each patient. Opening up a totally new era in denture tooth fabrication, these teeth are available in multiple shades and can be fabricated using a single layer or multiple layer technique. They have natural

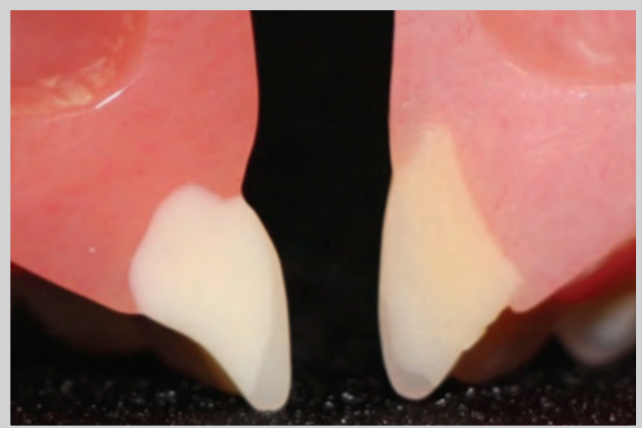


Fig. 1. Cross Section of AvaDent® Monolithic Milled Tooth and Base (left), Traditional Bonded Denture Tooth (right)



Fig. 2. AvaDent® XCL-2, with dual layer technology

incisal and occlusal embrasures and proximal contact locations that enhance the natural, esthetic appearance of the teeth. This technological advance of digitally morphing and scaling virtual denture teeth creates



Fig. 3. AvaDent® XCL-2 Removable Overdenture with Secondary Milled Superstructure

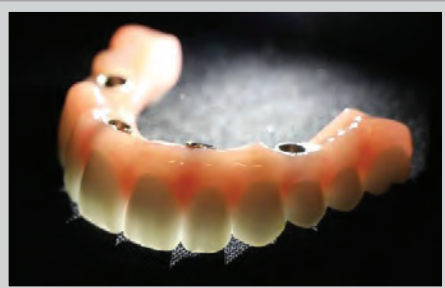


Fig. 4. AvaDent® XCL-2 Fixed Hybrid Prosthesis

substantial gains in esthetics and functional occlusion, and eliminates the arbitrary grinding and sculpting of manufactured artificial denture teeth.

Fixed Hybrids and Overdentures: Utilizing a similar manufacturing process developed for its denture fabrication, AvaDent provides options to the bar supported arenas. The digital design of the bar and denture are merged together into one prior to milling and processing. AvaDent fixed and overdenture solutions have virtually eliminated the tooth “pop-off” and delamination issues. (Figures 3 & 4)

Fixed Hybrid Retread: Another exciting advancement is the ability to generate new dentition that will join the old bar for the creation of a “retread” of the fixed hybrid prosthesis. Benefits include reduced breakage and virtually no tooth delamination.

Digital Record: With the AvaDent Digital Denture, a file is created and saved that allows milling of a duplicate denture if needed, whether as a replacement, spare, or for a next step toward full-mouth

rehabilitation. In addition, when doing a multi-step restoration where there is a need for the occlusion to be identical to the prior prosthesis, the digital record assures morphological consistency between prostheses.

3D Viewer: This offers clinicians a full 3D interactive design of the case 24 hours after patient records are received. (Figure 5) Clinicians will be able to review the virtual teeth arrangement and make changes to ensure desired occlusal scheme and esthetics have been achieved. Complete model analysis of the teeth arrangement is also possible with the ability to view “through” the

arrangement with transparency features that allow analytic assessment prior to approval for fabrication of the prostheses.

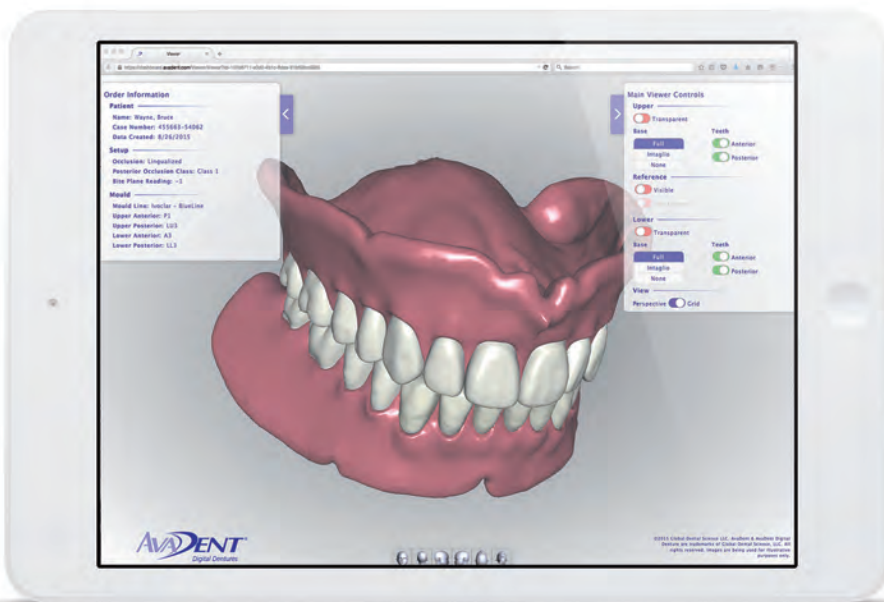


Fig. 5. AvaDent® 3D Viewer offers a virtual try-in



Fig. 1. 3D Printer

DENTCA CAD/CAM Denture

Fabrication of dental prostheses with DENTCA utilizes a computer-aided design and manufacturing (CAD/CAM) software system, and a digital denture file database.

The system automates the denture making process for precision; and incorporates an optical impression scanning system, a stereolithographic additive printer, and light polymerizing technology and processing for denture fabrication. In the US, dentists send impressions to Whole You, Inc., with which DENTCA has partnered. Impressions are scanned and dentures are designed automatically by the 3D denture designing software that DENTCA developed. Dentists send impressions to DENTCA where they are scanned and dentures are designed automatically using design software. Printed denture prototypes are made and are optional for try-ins, and final dentures can be 3D printed directly as well without having any try-in steps when that is requested. (Figure 1)

DENTCA 3D printable denture base material was granted approval for biocompatibility testing in accordance with the FDA Blue Book Memorandum #G95-1 and International Standard ISO 10993-1. The printed denture base material was tested for genotoxicity, cytotoxicity, sensitization, irritation, and material characterization. Recently, DENTCA

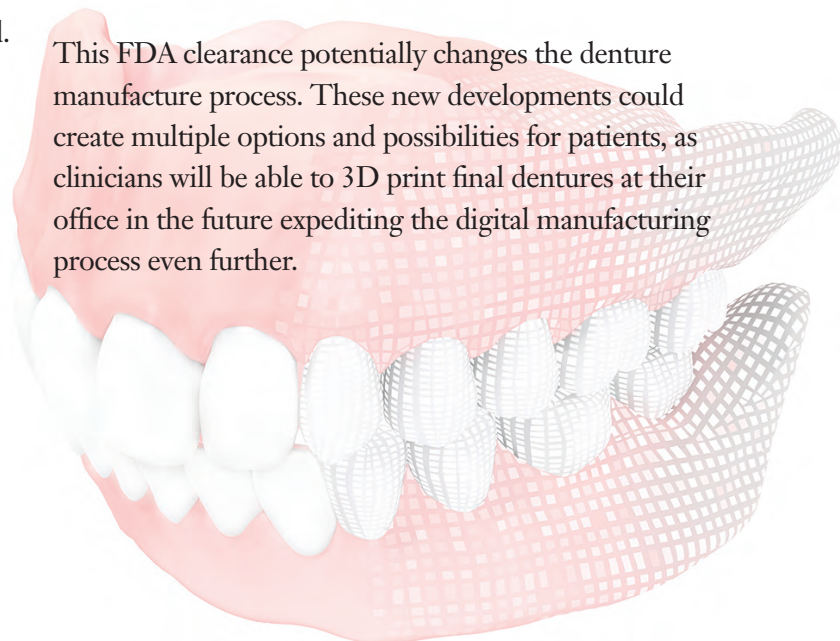


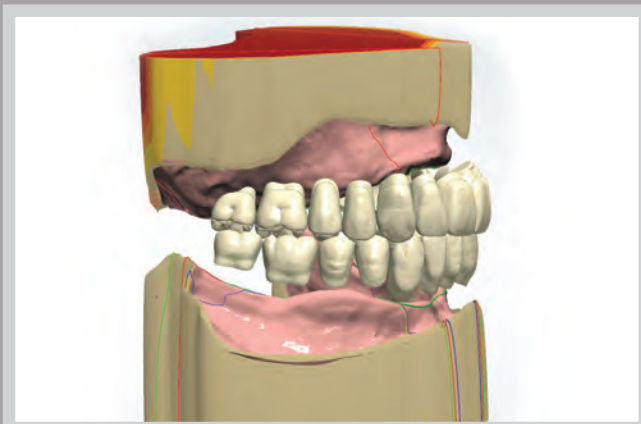
Fig. 2. 3D Printable Denture Base Material (clockwise): Original, Reddish Pink, Light Pink and Dark Pink.

received FDA (510 K) clearance for the use and manufacture of the first 3D printable denture base material (Figure 2); able to be worn inside the oral cavity, in a definitive removable restoration prosthesis.

Light-polymerizing resin can be used for fabrication and repair of complete and partial removable dentures. This printing technology could eventually replace the conventional heat-cured or cold-cured and auto polymerizing denture processing methods. The increased precision that could potentially be achieved with 3D printers offers a faster and predictable outcome. This is scheduled for release by DENTCA to the market in a few months.

This FDA clearance potentially changes the denture manufacture process. These new developments could create multiple options and possibilities for patients, as clinicians will be able to 3D print final dentures at their office in the future expediting the digital manufacturing process even further.





Ivoclar Vivadent Digital Denture Technology

Computer aided design (CAD) and computer aided manufacturing (CAM) for the fabrication of dental restorations has become a major trend in restorative dentistry. Unquestionably this technology has contributed to remarkable advances that would not be possible otherwise. Until relatively recently CAD/CAM dentistry was primarily limited to the area of fixed replacements. Today we are seeing significant advances in CAD/CAM removable prosthodontics which will eventually create new standards of manufacturing in this area of dentistry.

Ivoclar Vivadent will introduce their “laboratory based” Digital Denture System in the fall of this year. This differs from the current options which are primarily centralized manufacturing centers. Individual laboratories or clinicians who purchase this system will have all components of the manufacturing process (scanner, software, and milling unit). The Ivoclar system opens possibilities for the technician and clinician to provide multiple work flows and utilize the technical expertise of the technologist to customize their CAD/CAM support, not only for the final dentures but for numerous other steps in the procedures (custom trays, bite rims, tracing components, etc.).

The clinician is able to maintain the traditional local laboratory support & relationship while upgrading the manufacturing process. The Ivoclar Vivadent system facilitates the attainment of accurate patient information utilizing several unique component options like the Universal Transferbow System (UTS)

CAD® and the Gnathometer CAD® for obtaining facial plane records and jaw registrations. In addition, Ivoclar Vivadent has an extensive denture tooth portfolio embedded into the software which includes multiple occlusal scheme options.

Unquestionably the advantage of digital technology is to create high precision functional removable prosthodontic restorations. Material advantages include elimination of distortions caused by gypsum shrinkage, wax cooling, and dimensional processing errors. Technical advantages include having a default denture tooth arrangement, a default wax pattern, and precision milling process. For the dental lab this not only reduces the active working manpower time but also allows the attainment of improved manufacturing standards. Patient advantages include superior fit of the prosthesis, uniform thickness (thinness) of the restoration, electronic preservation of the dentures, and more hygienic denture bases.

For the clinician, digital technology provides the opportunity to facilitate removable clinical procedures and help develop the accurate transfer of clinical data in a practical, efficient, and economical technique. In addition digital technology can provide the clinician with more teachable and learnable techniques that can facilitate educational needs.

The Ivoclar Digital Denture System will be demonstrated at the ACP Annual Session’s Corporate Symposia on Saturday, October 24, 2015 from 9 a.m.–12 p.m., presented by Dr. Frank Lauciello and William Barton, CDT. ■

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University of Louisville prosthodontics program graduates first two residents

Dr. Ryan Lewis and Dr. Brandon Stapleton are the first to complete the new prosthodontic residency program at the University of Louisville School of Dentistry. The program re-opened in 2012 with an emphasis on combining the foundation of prosthodontics with advances in digital dentistry.

“The program was initiated to foster innovation and discovery,” said Dr. John J. Sauk, Dean of the School of Dentistry. “In so doing, we sought to educate clinicians that would translate contemporary materials and bioengineering advances into high quality clinical care and move the oral health profession forward.”

As a child, Dr. Stapleton had unique jaw problems requiring surgery for correction. His gratitude for the work of his dentists created in him a desire to follow in their footsteps and give others a new smile. Now, Dr. Stapleton has begun his own practice in Lexington, KY, while also serving part-time on the School of Dentistry faculty.

Dr. Lewis is translating his passion to help others by providing excellent dental care and pushing the boundaries into new sciences. He recently moved to Colorado to pursue practice limited to prosthodontics using his restorative and surgical training to serve patients on the front range of the Rocky Mountains.

Call for Applications: GSK Prosthodontist Innovator Research Award

The ACP Education Foundation is proud to announce the 2015 GSK Prosthodontist Innovator Research Award, which supports key areas of interest for the future of prosthodontics.

The goals of this research, sponsored by GlaxoSmithKline (GSK) Consumer Healthcare, are to advance the understanding of prosthodontics-related biological and/or materials systems, human behavior, cost and care delivery, as well as economic modeling and quality of life investigations. One, single-year funding in the amount up to \$12,500 to initiate or foster research in these areas will be awarded to an ACP member prosthodontist and to his/her institution. This educational grant is open to prosthodontists who are within 5 years of their initial appointment at a US or Canadian dental school or related academic institutions. The applicant must be a member of the ACP and show outstanding promise in their research area.

Submission guidelines can be found at acpef.org. Completed applications must be received by the ACP Education Foundation by Nov. 4, 2015.

New Position Statements

ACP position statements are issued on scientific, clinical, and other important topics related to oral health, dentistry, and the dental specialty of prosthodontics. Members may distribute position statements to patients and referring dentists, reference them during media interviews to clarify complex issues, cite them as the College’s official stance, and link to them in press releases for their practices.

In June, four new position statements were approved, bringing the total number of position statements available for member use to 17. Topics included:

- Dental Laboratory/Dentist Relationship
- Eating Disorders and Gastroesophageal Reflux Disease
- Role of Oral Devices in Managing Sleep-disordered Breathing Patients
- Tobacco Use and Oral Health

Many other position statements are in development, and the Board invites you to suggest additional position statement topics that would help you in practice.

New Affinity Programs

Did you know about these three new ways to save money and improve your practice? Since May, the ACP has launched three new affinity programs: SoFi (Social Finance, Inc.), PBHS, and BrightSquid.

SoFi Student Loan Refinancing refinances student loan debt at lower rates than federal and/or private options, saving their dental borrowers \$30K on average.

PBHS Website Design and Online Marketing has helped over 6,000 dental specialty practices create a strong Internet presence with state-of-the-art website design, Search Engine Optimization (SEO), and social media marketing services.

BrightSquid provides secure, HIPPA-compliant email that allows dental and medical professionals to share protected health information with business associates (such as fellow specialists).

Affinity Programs are an ACP member benefit, offering exclusive services and prices through selected vendors who have experience working with prosthodontists.



Journal of Prosthodontics New Virtual Issue

The *Journal of Prosthodontics* is proud to present its second virtual issue, "Digital Dentistry in Prosthodontics." This is an online-only collection of articles published in the *Journal of Prosthodontics* in the past two years. The 12 articles in the issue provide a global perspective on clinical applications of digital dentistry and the cutting-edge technologies used in craniofacial rehabilitation.

Articles include a summary of the state of the art techniques used in intraoral optical impressions, and a comprehensive discussion on the use of additive manufacturing technology in fabrication of removable partial dentures. Several evidence-based research manuscripts investigating marginal fit of CAD/CAM crowns, dimensional accuracy of two-step impressions using digital technology, micro-defects in zirconia restorations, and fracture resistance of digitally fabricated ceramic onlays are also included. Finally, the virtual issue presents clinical reports highlighting advanced techniques to achieve passive fit of CAD/CAM frameworks, and methods to digitally plan and immediately load implants in the esthetic zone and to custom mill zirconia and lithium disilicate restorations for complex rehabilitation of patients.



Scientific advances in digital technology are causing an unparalleled revolution and a paradigm shift in how dentists plan, design, and manufacture restorations and how they treat patients. The research in the *Journal of Prosthodontics* is on the forefront of these advances. The articles in this virtual issue will be freely available to everyone until the end of 2015, so please, share with your colleagues, students, and referral network.

Full-text *Journal of Prosthodontics* articles are always free to ACP members by logging in through the ACP website and clicking "Click Here to Read the Journal Online".

Upcoming Events

45th Annual Session
Orlando
Oct. 21-24, 2015
acp45.com

Digital Dentistry Symposium
Chicago
Feb. 22-23, 2016
Prosthodontics.org

National Prosthodontics
Awareness Week
April 3-9, 2016
Prosthodontics.org/NPAW

46th Annual Session
San Diego
Oct. 5-8, 2016
Prosthodontics.org



Welcome New Members

June 2015–August 2015

New Advanced Program and Graduate Student Alliance Members

Dr. Ibrahim Mansour Ababtain
 Dr. Ahmad Khalid Alhokail
 Dr. Hatem Ahmed Alqarni
 Dr. Andrea C. Marable
 Dr. Arpit Nirkhivale
 Dr. Marianita Vasquez

New Dental Technician Alliance Member

Reinstated Fellow
 Mr. Jerry I. Kaizer

Reinstated International Member

Dr. Ibrahim A. Ismail

New Global Alliance Member

Dr. Kevin J. Jennings

Reinstated Members

Dr. David C. Anderson
 Dr. Marjorie W. Barndt
 Dr. Reena C. Gajjar
 Dr. Sophana Hem
 Dr. Karen K. Kang
 Dr. Athanasios Kokkas
 Dr. Amy G. Mason
 Dr. Dana Marzocco
 Dr. Patrick W. Seely
 Dr. Darryl A. Simms
 Dr. Dalton P. Wilson

New Predoctoral Alliance Members

Ms. Elahe Behrooz
 Ms. Elizabeth Seymour Felton
 Ms. Angela Gullard
 Ms. Kristin A. Hutkin
 Ms. Danielle J. Indelicato
 Mr. Mitchell A. Loeb
 Mr. Uvoh E. Onoriobe
 Mr. David P. Remiszewski
 Ms. Sihana Rugova
 Ms. Lisa St. Bernard
 Mr. Jeffrey Willis
 Mr. Chris Yang

New Resident/Graduate Student Members

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 Dr. Haidar Ali Alalawi
 Dr. Dhari Alenezi
 Dr. Anthony S. Alexander
 Dr. Ali H. Alfaifi
 Dr. Areej A. Alfaifi
 Dr. Hamed S. Alghamdi
 Dr. Reem A. Alghamdi
 Dr. Ali F. Aljamah
 Dr. Adel AL Maaz
 Dr. Sami Abdullah Almohefer
 Dr. Saad S. AlResayes
 Dr. Sarah F A Alsadun
 Dr. Nicole I. Andreini
 Dr. Waleed Nasir Asiri
 Dr. Mohanad Atwa
 Dr. Ashley Azizian
 Dr. Rafiullah Bashiri
 Dr. Ryan J. Becker
 Dr. Edmond A. Bedrossian
 Dr. Druthil Belur
 Dr. Pranav P. Bhide
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Job Opportunities

California (Roseville/Sacramento) -

Associate opportunity for energetic and enthusiastic Prosthodontist leading to practice purchase. Long established solo practice with primary focus on implant-related dentistry. Primarily fee for service, 4 treatment rooms, large laboratory in 1800 sq. ft. Located in the heart of California, close to ski resorts, ocean, lakes, and unlimited outdoor activities. Send cover letter and CV to binondds@gmail.com.

California (Santa Clarita Valley) -

Exceptional opportunity for a young energetic Prosthodontist in an established practice in the Santa Clarita Valley. An associateship leading to partnership and eventual buy out. Fee for service and indemnity insurance. Lab and technician on premises. 4 days of hygiene per week. Please respond to rex6869@gmail.com.

Illinois (Skokie) -

Outstanding partnership opportunity for a talented, caring, energetic, detailed-oriented Prosthodontist with excellent verbal and interpersonal skills. Beautiful office with exceptional laboratory support. Fee for service practice with emphasis in Fixed Prosthodontics, Implants and Restorative. Send CV to: oralrehab1@gmail.com.

Illinois (University of Illinois at Chicago) -

CLINICAL ASSISTANT/ASSOCIATE PROFESSOR, University of Illinois at Chicago, Prosthodontic Sciences - Restorative Dentistry

The Department of Restorative Dentistry in the College of Dentistry at the University of Illinois at Chicago, under the leadership of Stephen D. Campbell, DDS, MMSc, is seeking applications for two full-time faculty positions (non-tenure track) at the Clinical Assistant/Associate Professor levels.

Responsibilities include preclinical and clinical instruction in all aspects of Prosthodontics and Restorative Dentistry. Opportunities for teaching exist at the Pre-doctoral and Advanced Program level and include implant prosthodontics. Future tenure track options exist for qualified/successful candidates.

Qualifications include a DDS/DMD degree and advanced training in Prosthodontics

(board certification, eligibility desirable, but not required). Candidates with training and/or experience in research will be preferred. Clinician Scientists are strongly encouraged to apply.

For fullest consideration, applicants must apply online at <https://jobs.uic.edu/job-board/job-details?jobID=51279> and submit a cover letter, CV, and names of three (3) references by September 1, 2015. Review of applications will begin immediately and continue until the positions are filled. Salary and academic rank commensurate with experience and qualifications. The positions will begin December 2015 and July 2016.

The University of Illinois at Chicago is an Equal Opportunity, Affirmative Action employer. Minorities, women, veterans and individuals with disabilities are encouraged to apply.

South Carolina (Medical University of South Carolina) -



The James B. Edwards College of Dental Medicine, Medical University of South Carolina is seeking

applications for a full time Prosthodontist faculty position in the Department of Oral Rehabilitation, Division of Removable Prosthodontics. The Division provides classroom and clinical instruction for pre-doctoral dental students and AEGD Residents in all areas of removable prosthodontics, to include digital design and prosthesis fabrication. The Prosthodontist will work collaboratively within all disciplines of the department and other departments of the College of Dental Medicine in a comprehensive care environment.

Qualified candidates must hold a DDS or DMD degree, have graduated from a Prosthodontics Residency program with preference given to board eligible or certified. Experience in educational innovation, use of technology in education and computer skills are expected with preference given to those with previous teaching and research experience. Successful applicants should have a South Carolina Dental License or qualify for a teaching license. Salary and rank will be commensurate with experience. Participation in the Dental Faculty Practice for private patient care is expected. MUSC is an EEO/AA employer—minorities and

women encouraged to apply. Apply online at <http://academicdepartments.musc.edu/hr/>

Texas (Dallas) -

Board certified Prosthodontist is seeking a motivated associate to join our practice. We offer state of the art technology and facilities: Modern office with fully equipped removable and fixed in-office labs, digital radiography, cone beam CT scan and great support staff. Email BCPDallas@yahoo.com.

Vermont (Brattleboro) -

1st Advantage Dental is an established multi-specialty group practice with locations in New York, Massachusetts, and Vermont. Whether it's the Capital District of New York or the beautiful Pioneer Valley of Vermont, we are committed to providing the best possible oral health care to our patients. We are interested in speaking with candidates interested in joining our Brattleboro, VT practice. Send CV & Cover Letter to kateanderson@amdpi.com.

Practices for Sale

Arizona (Scottsdale) -

Striking and immaculate practice, with its beautifully alluring landscape and large floor-to-ceiling windows, gives patients a relaxed and tranquil feeling. Located in a Medical/Professional venue. The office is ~2,750 sf w/ 4 ops + 1 add'l. Asking \$950K. Call 800-641-4179 for more details.

Arizona (Tucson) -

URGENT- DISTRESS SALE: Medical condition requires immediate sale. Owner now limited on ability to perform clinical dentistry. Well established and respected prosthodontic practice for sale. Board Certified Prosthodontist with over 30 years private practice experience is willing to assist with transition if desired. Small staff, low stress, fee for service practice since 1993. All phases of prosthodontics, with emphasis on dental implants. There are only 3 other Prosthodontists in all of Southern Arizona. Why wait until you retire to enjoy the sun, scenery, and great weather in the Desert Southwest? Please email kimberly@azhcr.com and the doctor will call you back. All offers considered.

California (Napa) -

Prosthodontic practice established in 1985 occupies 1712 sq ft with 4 fully equipped operatories and on-site full service removable prosthetics lab. Collections just under 1 million on a 3 day work week with 2 days of hygiene per week. Contact Tim Giroux at 530-218-8968 or wps@succeed.net.

California (Palm Desert) -

State of the art multi-specialty practice established in 1992. Digital pano, Dentrrix, 5 ops, lecture room, ADEC equipment, 2,600 sq ft, great location. Prosthodontist that also places implants best candidate. Adding referrals doubles profits. Need to move out of state and am very motivated to sell. Collections over 800k in 2014. Serious inquiries only. Kept confidential. Email contact info to: golphinthedesert@gmail.com

California (San Joaquin Valley) -

Seller retiring from this wonderful practice. ~2500+ sf quite w/ 6 fully equipped operatories in a well-maintained, mixed Medical/Dental Complex near major thoroughfare. Doctor averages 7 patients with 6 hygiene patients/day and generates approximately 4 new patients/month. Listing #IC-468. Please contact Ed Cahill at (510) 844-0330 or wps@succeed.net.

Florida (Jacksonville) -

Well-established and respected prosthodontic practice seeking experienced prosthodontist to buy part or all of 20+ year old Implant focused practice in beautiful north Florida. Well-known in the community with long-term successful referral network. State of the art equipment with CT Scanner and in-house lab with over \$1.5M in collections. Owner/doctor will work as needed for smooth transition. For details on this great opportunity, please email northflapros@aol.com.

Indiana (Fort Wayne) -

Excellent opportunity to own a prosthodontic specialty practice established in 1980 located in large midwest metropolitan area midway between Chicago, Toledo and Indianapolis. Fee for service practice: fixed, removable, implant prosthodontics and maxillofacial prosthetics. Great referral base and staff

with gifted artistic lab technician and full lab onsite. Seller is looking to phase into retirement and is happy to stay as desired by buyer for introductions and transition. Annual revenues are 850k on a comfortable 4 day work week with 6 weeks of vacation per year. 2700 square foot office on basement is stand alone building with great visibility and available to rent or buy. Serious inquiries only to hoosierdeb@frontier.com.

Nevada (Reno) -

Well-established and very busy General and Prosthetic practice for sale. Grossing over 1.44 Million in 2014. Features a large, spacious on-site lab, 2 FT Lab Techs, 5 operatories, 3 Dentists, and an Oral Surgeon with a large referral base. Call 775-856-3858 for more details.

Utah (Salt Lake City) -

Salt Lake City prosthodontic practice for sale. Maxillofacial training helpful. 30 year established practice with good referral sources. 3 ops with room for expansion. 1755 sq. ft. Space can be leased or purchased. Contact at: 801-520-9292 or 801-450-8057. Send CV or resume to Linda Montgomery, PO BOX 2324, Park City, Utah, 84060.

Washington (Puget Sound Basin) -

Come live, play and work in the beautiful Pacific Northwest. Immaculate, well established and respected full range prosthodontic practice to include implant surgery. The office features four fully equipped operatories featuring full computerization and digital radiography. Two operatories are also equipped with surgical microscopes. The practice features an in-house state of the art fixed/removable dental laboratory and a new cone beam CT/digital panoramic scanner. Second floor suite in a modern medical office building with expansive windows throughout. The practice has a strong referral base from throughout Southwest Washington and has easy access from Interstate 5. Practice collections over \$1.3 million with fee for service only. Long term dedicated staff. The owner will stay on part-time as needed to facilitate the transition. For more details and information please contact: Jennifer Paine at (425) 216-1612 or email Jennifer@cpa4dds.com.

Washington (Seattle) -

Well established and mature prosthodontic specialty practice with exceptional reputation for sale in the Greater Seattle area. Procedures provided by the seller include crown and bridge, implants and complete and partial dentures. Fee for service practice with no contracted insurance. Outstanding, established referral base. Annual collections are consistently over \$2 million per year with very strong cash flow. Well managed practice with a high percentage net. Building is in a great location with plenty of parking and visibility. Seller could eventually sell the building to the buyer. Owner would stay on 1-2 days per week for up to a year or more to ensure a smooth transition and to introduce referrals sources. Contact: Buck Reasor, DMD Reasor Professional Dental Services 503-680-4366 info@reasorprofessional.com

Washington (Spokane) -

Well established solo practice focusing on removable prosthodontics and implant-related dentistry. Strong hygiene program. 6 treatment rooms, large laboratory in 2100 sq. ft. Centrally located in Spokane, Washington, close to mountains, lakes, ski resorts, and unlimited outdoor activities. Send cover letter and CV to phawkins@aftco.net.

Washington, D.C. Area -

State-of-the-art specialty practice. CBCT, Dentrrix, ALL DIGITAL OFFICE, PELTON AND CRANE equipment, 2,300 sq ft. Prosthodontist that also places implants best candidate. Tremendous growth potential. Serious inquiries only. Kept confidential. Email contact information: tkristalis@aol.com.

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