According to a 2002 estimate based on data from the national epidemiologic survey, edentulism has declined 10 percent each year. Yet, due to the growth of the U.S. population aged 50, which is estimated to increase in the next 10 years by 79 percent, the number of adults predicted to need complete dentures is expected to increase from 53.8 million in 1991 to 61 million in 2020.

Dentures are and will continue to be essential in dentistry for the aging population. However, there is hesitation by many clinicians to treat the edentulous patient, which can be extremely challenging due to the subjectivity of the treatment. Everything from the proper selection of teeth, where to position the teeth, how to communicate to the lab and judging variability of vertical and centric jaw positions, among many other aspects, are difficult to control and predict. Therefore success is often compromised leaving the clinician feeling not in control of the outcome and consequently removable treatment is perceived as a liability rather than a profitable, enjoyable part of practice.

With the successful introduction of implant dentistry the edentulous state can be remarkably improved which has inspired a renewed interest for the edentulous patient to seek retreatment. Depending on the number of implants placed, there are a variety of restorative options that can now be considered. If properly diagnosed and efficiently treated, these restorations represent a tremendous financial incentive for the clinician and dental lab. Unfortunately denture techniques and materials of the past offer limited solutions. Today’s clinicians are less apt to engage in time-consuming chairside removable procedures and have become more reliant on laboratory support.

This, of course, requires accurate communication with the dental lab.

**A Systematic and Simplified Approach**

The challenge for the professional team is to seek out a denture system that will enable accurate impressions and patient records, tooth selection that is patient specific and aesthetic, communication of essential patient information to the lab and special attention to the accurate and hygienic processing of the denture base material.

Having the opportunity to work with a multitude of dental laboratories, clinicians and academics has given me the opportunity to evaluate many suggested systems of treatment for the edentulous patient. I consider the Ivoclar Vivadent removable system presented in this article as a composite of ideas, techniques and materials that is a logical solution to minimize the subjective variables of removable treatment that cause time consuming miscommunications and ultimately less than desirable outcomes. This system has been taught in our educational programs for several years and has provided clinicians and dental labs with a successful framework to increase profitability and success. I have grouped the discussion into four categories: impressions and patient records, tooth selection, communication and denture base processing. This article is not meant to be totally comprehensive, so each of these categories will be outlined and lightly addressed.

**Impressions and Patient Records**

Understanding the anatomy and physiology of the edentulous mouth is critical in developing an accurate impressioning technique. Knowledgeable border molding is particularly important for the mandibular arch which has the major complication of having the tongue as a major determinant of retention and stability. For the mandibular arch, the choice of impression materials is not nearly as critical as the impressioning technique. On the other hand, the stability and retention of the maxillary denture is more a product of adhesion and cohesion and is best
impressioned using a technique and material that captures the tissues in a rested mucostatic condition. Briefly stated, the mandibular impression requires a preliminary impression, custom tray, border molding and final wash. The maxillary impression can be a single entry irreversible hydrocolloid impression which if done carefully can be considered the final impression relatively routinely. The AccuDent System 1 is an excellent system of material and tray design and is the choice for single entry final impression systems.

Making a provisional centric jaw record can provide a significant form of communication to the dental lab. The centric tray is a tool that provides a platform to retain impression putty material to record a tentative intra-oral relationship. This will allow the casts to be mounted early in the procedure for diagnostic purposes and it also allows the laboratory an option to assemble a bite-recorder.

I have always been an advocate for bite-recorder devices to facilitate vertical and centric jaw registrations. Unfortunately they have a history of being intimidating and therefore rather unpopular. A little-known device called the Gnathometer M is a unique instrumentation that not only provides the bite-recorder option but can also be used to simplify the mandibular final impression procedure. Having the casts mounted using the centric tray record greatly facilitates the assembling of the Gnathometer M by the dental lab. As we all know, border molding the mandibular impression can be extremely challenging. This device allows the patient to be in a stable closed-mouth position. Once the mandibular impression is made, the white bite tabs can be removed and the bite-recorder elements attached allowing vertical dimension to be accessed and provides a stable tracing pin to stabilize the bases while the centric record is made. In selected circumstances an intra-oral Gothic arch tracing can also be performed. These techniques greatly improve and simplify the challenging procedures of mandibular final impressioning and jaw registration. Chairtime is reduced since the laboratory provides support.

Denture Tooth Selection

Often times this responsibility is delegated to the dental laboratory. Although most laboratory technicians can provide assistance, it is a bit unfair since they do not have the advantage of seeing the patient. Denture tooth selection systems of the past (square, tapering, ovoid) have focused on criteria that are inaccurate and impossible to effectively practice. The BlueLine denture tooth system was the first to break from these old systems and reclassify their maxillary anterior teeth by size - small, medium, large - and individual characteristics of soft and bold. This concept has been further advanced with the PHONARES new line of denture teeth, which also classifies the teeth to age. These are logical criteria that are teachable and have made tooth selection simplified and more accurate for the clinician. Both systems provide individual FormSelectors, including a facial meter, which measures the interala distance and helps to determine an appropriate size for the anterior tooth selection.

The selection of denture tooth material is dependent on optics, wear and toughness. The BlueLine is representative of
the premium, double cross-linked polymethylmethacrylate (DCL-PMMA) and the PHONARES represent a nano-hybrid composite (NHC) resin chemistry. Cross-linked PMMA chemistry has been the standard in the industry for many years and has acceptable aesthetics, wear and exceptional toughness. The composite resin chemistry has improved optical qualities due to the opalescence of composite resin materials. Wear is also significantly enhanced which is an advantage for implant restorations which tend to show premature wear with conventional PMMA. However in situations where there is minimal restorative space, the PMMA-based denture tooth might have the advantage since it has more “toughness” and less chance for fracture when it is ground thin.

Posterior denture tooth occlusion choices are primarily classic semi-anatomic, lingualized and non-anatomic (monoplane). If aesthetics of the premolar area are important, the semi-anatomic choice has better aesthetics in this area because the buccal cusps of the maxillary premolars are functional and set similar to natural dentition. If function or prevention of cheek biting is most important, lingualized occlusion has an advantage since the maxillary buccal cusps are tipped upward accentuating the penetrating quality of the maxillary palatal cusp. In addition, the tipped maxillary buccal cusps protect the cheek tissues from being “bit” during function. Non-anatomic teeth set monoplane are thought to be the least challenging tooth form to set, however aesthetics and function are compromised.

**Tools of Communication**

There are many tools that help gather patient information and communicate to the dental laboratory. The centric tray, Gnathomether M and FormSelector have previously been mentioned. The Papillameter is used to measure maxillary lip length to determine the necessary amount of incisal display. Denture gauge measures the incisal length of the patient’s existing denture. Both these devices help to communicate the appropriate incisal length of the maxillary wax rim or denture teeth; otherwise the lab must use average values. The biteplane is an invaluable tool for evaluating the horizontal plane and occlusal plane of the maxillary wax rim. The flat set up table is used to mount the maxillary cast with wax rim. This orientation transfers the hori-
horizontal plane and occlusal plane to the Stratos Articulator. The table also serves to provide a template for setting the maxillary anterior denture teeth and assures that they will be the same length and horizontal plane as the maxillary wax rim. The Stratos Articulation System is very user-friendly and is the favorite of many dental laboratories. It has an extremely accurate and durable calibration so there is never need to send the articulator in the mail since the casts will fit accurately on the laboratory Stratos. The structure of the instrument is also very durable and easy to maintain. The wide assortment of components allows many options for mounting and setup templates. In addition the articulator is very presentable in appearance.

Each step of the communication process is managed by a comprehensive case planning software called Intercom. Developed by Ivoclar Vivadent, Intercom, improves communication between the dentist and dental laboratory, and virtually guides the user through each step of a fixed or removable restoration. Each step is accompanied by treatment-related literature, videos and similar tools helping to specify the appropriate process parameters. Upon case completion the software produces a detailed prescription, which can be e-mailed or sent as hardcopy to a designated lab partner.

**Denture Base Processing**

Once approval is received to fabricate the definitive denture prosthesis, a precision injection molding process eliminates the inaccuracies in fit and function that could otherwise be caused by polymerization shrinkage. Traditional denture materials are hand measured, leaving room for inconsistencies and mixing errors, and standard trial packing is predisposed to warpage and shrinkage. However, the SR Ivocap system combines controlled heat and pressure polymerization, so denture bases consistently demonstrate an accurate fit, a high degree of polymerization and high polishability.

Ivocap compensates for acrylic shrinkage by continuously flowing the exact amount of material needed into the flask during the entire polymerization curing cycle. The material is distributed in pre-measured capsules, requiring no measuring which eliminates human error and also prevents direct material contact with the skin minimizing the risk of irritation.

And although the features and benefits of the SR Ivocap injection system seem immediately beneficial to the laboratory technicians, their significance to dentists and to their patients cannot be overstated. The accuracy of injection processing improves denture base stability and retention which assures the patient the best possible fit and minimizes the necessity for post-insertion adjustment. In addition this system results in a denture surface that is more dense and therefore more polishable and resistant to plaque accumulation, which helps to ensure proper oral hygiene after delivery of the prosthesis.

**Conclusion**

According to recent projections, the edentulous population will increase for at least the next 10 years, along with demand...
for removable prosthetic care. To meet this demand, more dentists must provide this service, but their ability to do so is predicated on the availability of systematic and easily integrated denture solutions. Although edentulous cases might be intricate, they also present an opportunity for the dentist and laboratory technician to collaborate to ensure outstanding rehabilitation results for the patient.\textsuperscript{1,14} Ivoclar Vivadent’s removable denture systems provide viable solutions to the clinical challenges of edentulism and denture fabrication. Eliminating the complexities of denture fabrication with methodical steps and reliable laboratory techniques, dental professionals can improve the quality of life for edentulous populations using simplified and highly accurate techniques.

References


Author’s Bio

Dr. Frank Lauciello graduated from the State University of New York at Buffalo (SUNY), School of Dental Medicine in 1969 and completed his Prosthodontic training at the Buffalo VA Medical Center. He is a Clinical Associate Professor in the Restorative Department at SUNY at Buffalo and was director of the Veterans Administration Advanced Prosthodontic Program from 1973-1998 and Chief of the Dental Service from 1996-1998. He is presently Director of Removable Prosthodontics Research, Development, & Education for Ivoclar Vivadent, Amherst, NY and Director of the Implant Esthetic Center of Excellence in Sarasota, Florida.

Dr. Lauciello is a Diplomat of the American Board of Prosthodontics and has authored 25+ articles including several chapters of textbooks. He is actively involved in dental research and new product development.