Florida's Outlook On the Dental Laboratory Profession
1st Quarter 2018
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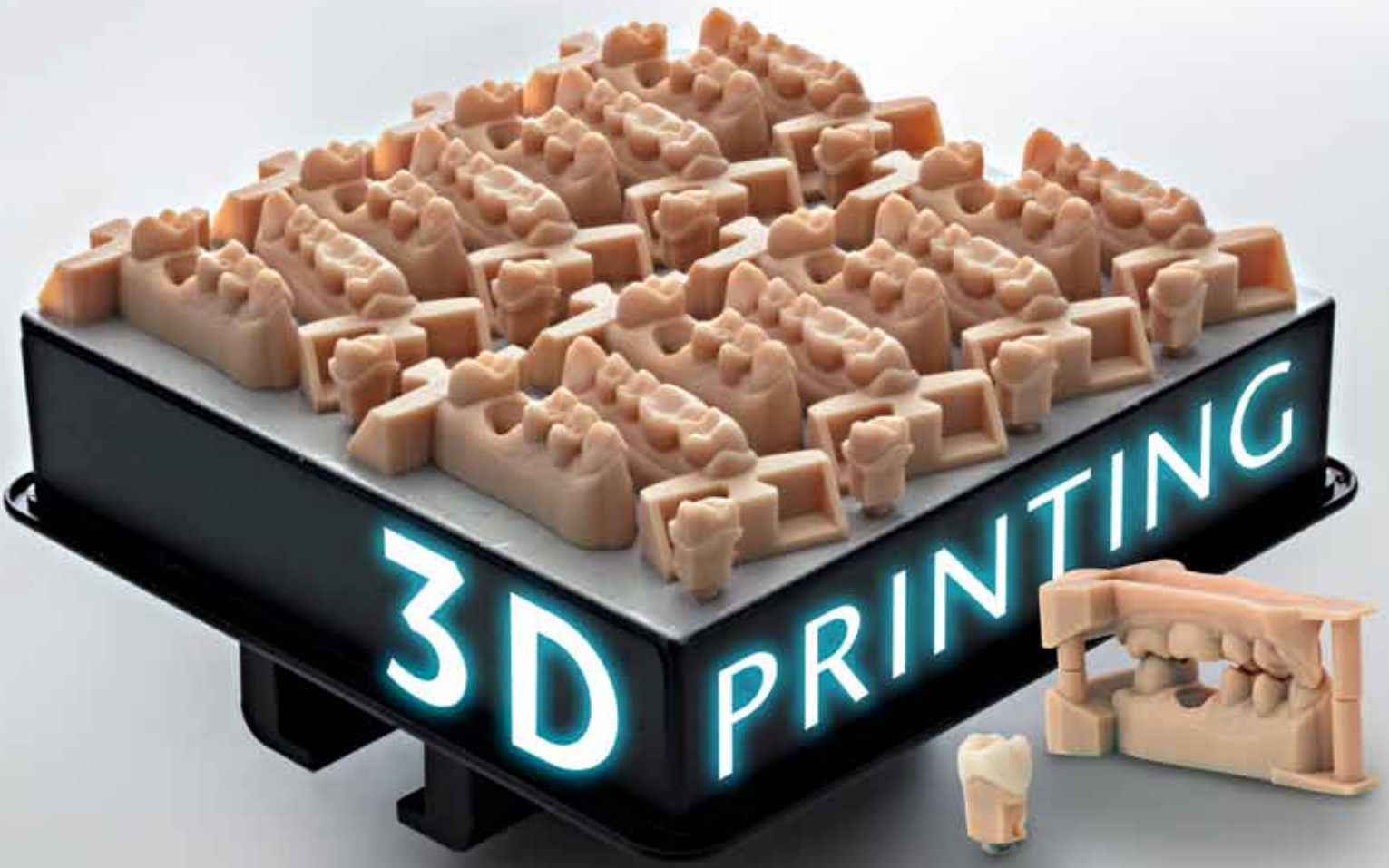

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Change? It's All Around Us.

The one constant in the dental laboratory business is change, but still with the rapid pace of how things are going, it's amazing that we don't all have whiplash from things like:

- Growth in group practices.
- Continued digitization of how we manufacture dental restorations.
- Consolidation of suppliers and manufacturers.
- Decrease in the number of dental labs.
- Increase in material and equipment options.

Add this to the hurry-up mentality that has many of us running at full speed to keep up with all the changes. When I get a chance to sit back and take a breath, it's then that I'm grateful for the Florida Dental Laboratory Association.

The FDLA is a strong organization and offers its members many benefits, from educational opportunities through the Southern States Symposium & Expo, *focus* magazine and the various district workshops. Each of these opportunities have helped me grow as a technician and lab owner.

The real key to how FDLA makes life as a dental lab owner, manager or technician better is its people. With all of the changes going on around us, we have to work together and move forward together for the benefit of our profession and our patients.

We also need to look at each other as one group, not as competitors. We need every dental lab technician to get involved with FDLA. I strongly encourage you to bring your ideas, questions and concerns to the meetings. The FDLA Symposium & Expo is the perfect time to exchange ideas, learn about the latest changes and connect with your fellow dental professionals.

The changes facing us can be daunting, but together we—the small labs, big labs, mid-sized labs and the mom and pop labs—can move our industry forward.

Lenny Herrera, CDT
FDLA president

"We have to work together and move forward together."

FDLA Mission

Serving Florida's dental technology professionals as a valued part of the dental team enhancing oral health care.

FDLA Vision

Advancing the individual and collective success of Florida's dental technology professionals in a changing environment.

Values Statement

FDLA's board of directors and professional staff are guided by these principles:

- Integrity
- Leadership
- Recognition
- Safety
- Acceptance
- Innovation

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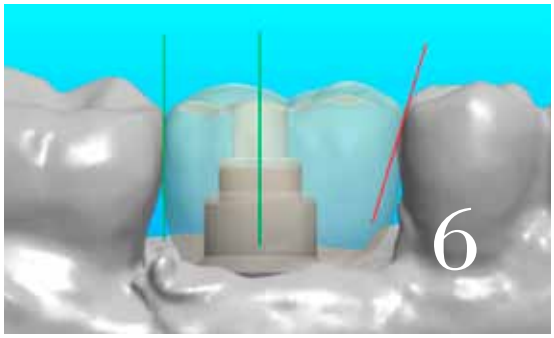

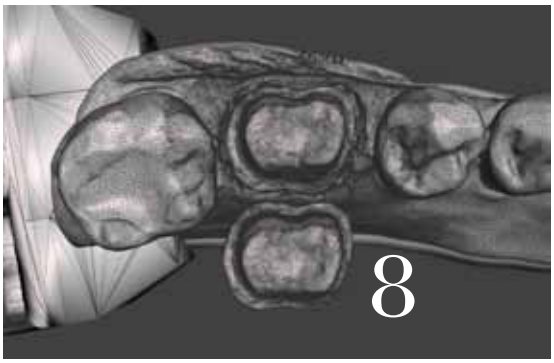

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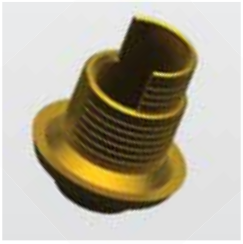

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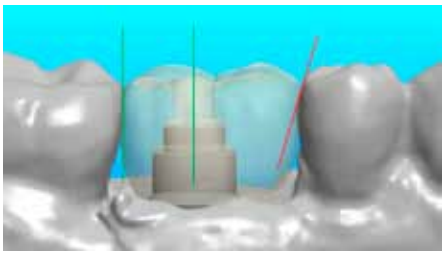
By Chris Peterson, CDT

Basics to SCREW-RETAINED SUCCESS

Are your clients requesting more screw-retained crowns lately? This growing trend in the industry is heavily advocated clinically because of perio-implantitus. At Peterson Dental Lab, we focus on three specific aspects to reduce chair time, making our screw-retained crowns stand out from the rest.



Implant Long Access Relative to Adjacent Contacts

(Above) With cement-retained restorations, the crown's insertion direction is idealized by the custom abutment, which should have the same path of insertion as the adjacent contacts. With screw-retained restorations, however, the crown's path of insertion should be parallel with the implant's long access and/or internal connections. A large majority of the time, this is not so because the clinician has a difficult time adjusting the contacts to be parallel with the long axis of the implant in the posterior region. The tip here is to communicate with the restorative doctor, because no one likes open contacts. Inserting an impression transfer or titanium cylinder intra-orally allows the clinician the ability to see if the contacts are parallel.

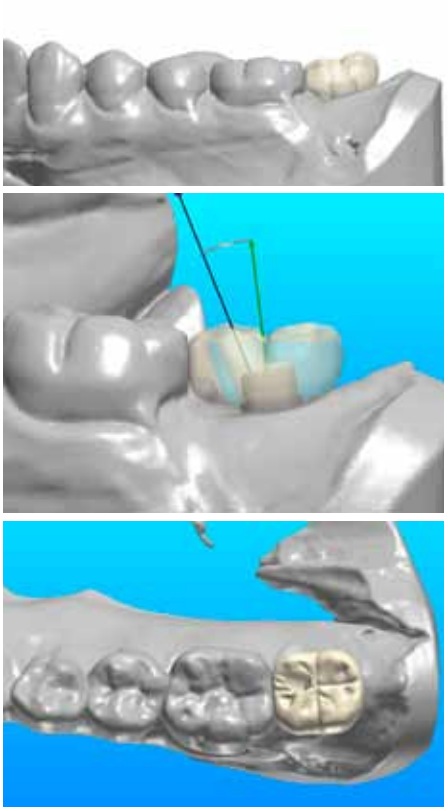
"Spend the extra money now, or lose clients later."

Implant Solid Model

(Above) An additional solid analog cast is imperative for accurate contacts. Inherent model inaccuracies caused by pinned model systems and technician abrasion can open contacts, requiring extensive adjustment chairside. Spend the extra money now, or lose clients later. Invest in an inventory of additional lab analogs for checking those contacts during quality control.

Angulated Screw-Channel

(Above Right) Don't disappoint the client with "I can't." This simple tool from your restorative armamentarium can be achieved with many manufacturers. From re-angulating screw access channels lingual in the anterior for esthetics, to re-angulating an access hole mesial for easy insertion in the posterior, this technology helps my lab deliver "yes" to the customer. In my opinion, on an upper first molar, angulating the access hole mesial of the MLCR (mesial lingual cusp ridge) and distal to the MMR (mesial marginal ridge) is ideal because the dentist does not have to fill a composite in a high functioning area.



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Chris Peterson, CDT, is Vice President of Peterson Dental Laboratory, CDL, a full service dental laboratory located in Delray Beach that employs more than 40 team members. He is a second generation laboratory technician certified in implants, crown and bridge and is Sandler Sales and Business Management trained.

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– Anton Woolf, CEO of Argen

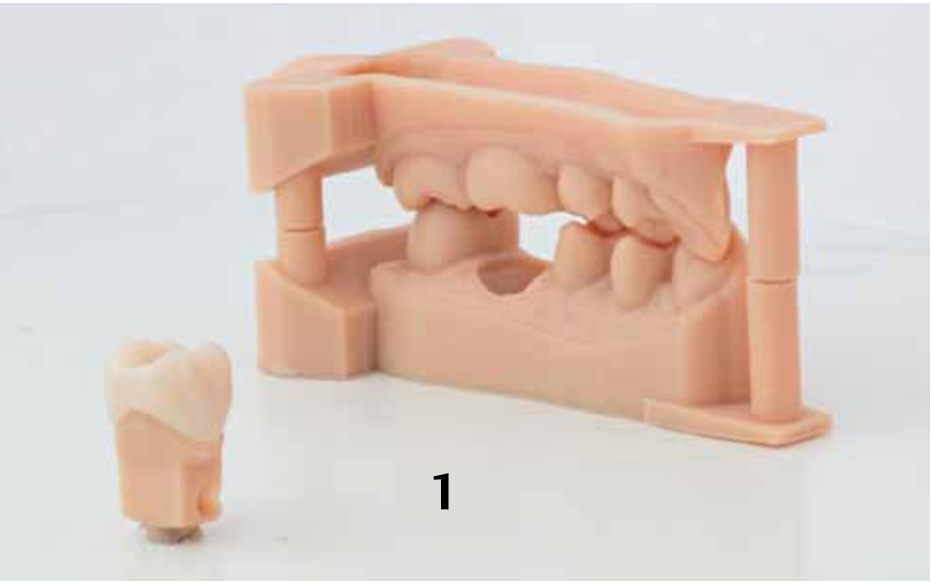
ARGEN

By Michael D. Scherer, DMD, MS, FACP

DIGITAL DENTAL MODEL PRODUCTION *with High Accuracy* 3D PRINTING

With intraoral scanning techniques having tremendously improved clinical dentistry practices and the accuracy of impression procedures,[1-4] the advent of affordable high-accuracy 3D printing technology represents a watershed moment within the dental industry. The ability to reliably and consistently produce highly accurate restorations within a private dental office or small dental laboratory can solve many of the problems associated with traditional techniques,[4-5] and yield significant savings in production time and costs.

In order to deliver such change, it's instrumental for clinicians to be able to trust that models printed on a 3D printing system are precise and accurate (**Figure 1**). Being able to manually test the feel and fit of physical models, just like those generated with traditional methods of model fabrication, is an essential step in the dental workflow. It is integral to the success of a final procedure. With digital systems, several options exist for generating physical models from digital scans.



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Until recently, most of the professional 3D printing market has been made of large-scale industrial-grade 3D printers, many of which run in a service bureau setting. In contrast, advanced desktop 3D printers, such as Formlabs' Form 2, have garnered considerable interest for producing models in-house for routine clinical dentistry practices.

Introducing cost-efficient, scalable 3D printing in-house allows for a smooth transition to fully digital, streamlined workflows that quickly return on investment. However, in order to effectively assess which printing technology to invest in, it is crucial to verify accuracy. To ensure success, we must be able to trust that 3D printed models are accurate, precise representations of a patient's anatomy.

DEFINING CLINICAL ACCURACY NEEDS FOR DENTAL MODELS

For a dental model to be used to effectively check restorations such as crowns or bridges, it is critical that it be used to check the marginal adaptation of the restoration (**Figure 2**). A good marginal fit is a key factor to the long-term clinical success of the restoration. Large marginal gaps can negatively impact acceptance rates of restorations, potentially leading to decay and premature loss of the restoration.

It is critical, therefore, that a dental model accurately and precisely reproduce the cervical line, also known as the margin line, of a restoration. In addition, for a dental model to be used for large multi-unit restorations, it is also critical to achieve an acceptable level of accuracy across the entire model. We, therefore, defined three measures by which to evaluate the accuracy of dental models:

MARGIN ACCURACY — The accuracy with which the margin line, and die surfaces above the margin line, are reproduced.

GLOBAL ACCURACY — The accuracy overall of the model, measured across a full arch.

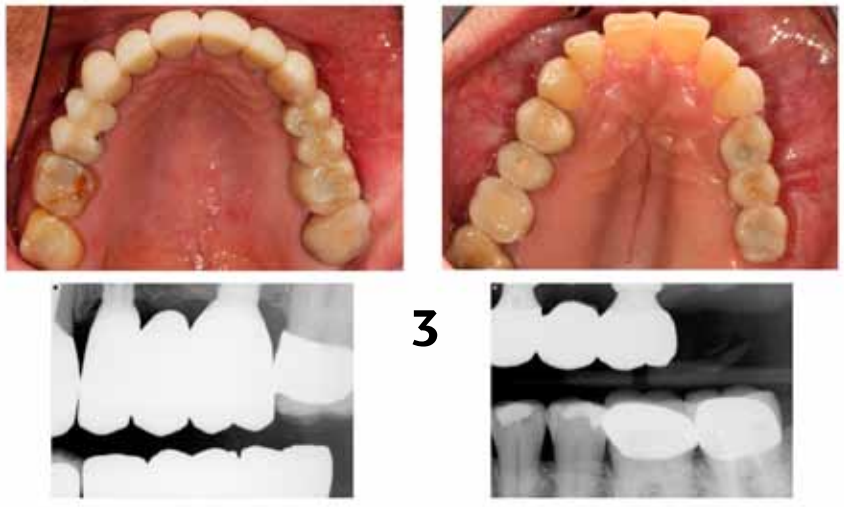
CLINICAL ACCURACY — The accuracy of the clinical fit of a restoration, such as a ceramic crown, inlay, or implant prosthesis, is usually established via a subjective analysis performed by a clinician or laboratory technician.

A tremendous amount of variability within this approach is evident within dentistry. While many clinicians commonly assert that restorations should fit with marginal adaptation discrepancies within 10-30fflm, studies by Christensen evaluating this request indicated that, in practice, clinicians accepted a range between 34fflm and 119fflm of crown misfit at the gingival margins.[6]

Furthermore, nearly half of clinicians were found to be inconsistent with their evaluation methods; sometimes the same clinician will reject the fit of a restoration that they accepted earlier (**Figure 3**).

While many methods have been advocated throughout the years, the two gold-standards of proper restoration fit within clinical dentistry are tactile feel with an explorer instrument and visual assessment with a radiographic image.

Figure 3
Pictured are two examples of very similar three-unit implant fixed partial dentures. Both show clinically acceptable restorations, but with no marginal discrepancy (left), and a slight, clinically acceptable marginal discrepancy (right).



TACTILE EVALUATION METHODS

Many clinicians utilize instruments, such as a dental explorer, to make decisions regarding the clinical fit of a restoration. Clinicians use the explorer instrument to feel over the restoration. If the instrument catches a groove near the margin, clinicians would reject the restoration, indicating that it wouldn't properly fit. Using scanning electron microscopy, Rappold showed that the new, unused explorer tip is 68fflm thick, ultimately indicating that many clinicians may accept a restoration misfit of up to that amount.[7] In addition, many clinicians do not routinely sharpen or purchase new equipment for each patient, thus potentially accepting increased levels of restoration misfit.

TO ENSURE SUCCESS, WE MUST BE ABLE TO TRUST THAT 3D PRINTED MODELS ARE ACCURATE.


4


5

An explorer is used to assess the clinical fit of a restoration by using the tactile feel of the instrument passing contours of the teeth. As the tip of the instrument slides into grooves or depressions on the tooth/restoration surface, it gives the clinician the ability to assess the clinical fit of a restoration (**Figure 4**).

OPTICAL EVALUATION METHODS

Radiographic assessment of dental restoration fit is an important method, used both by clinicians and also by third-party payors, such as dental insurance plans. Radiographic assessment utilizes a conventional dental X-ray generated image of the side, or proximal, portions of the dental crown to confirm the edges of the tooth preparation are meeting the margins of the restoration. While this method of assessment of clinical fit is subjective, it does offer a high degree of predictability between clinicians. It is, however, highly dependent upon angulation of the radiograph; increasing the angle decreases reliability. Angulation of the radiograph ffi10 degrees in a vertical plane can result in clinicians potentially missing open margins or result in a restoration misfit of 100fflm.[8] As radiographic angulation approaches 20 degrees, this can increase to as great as 700fflm.

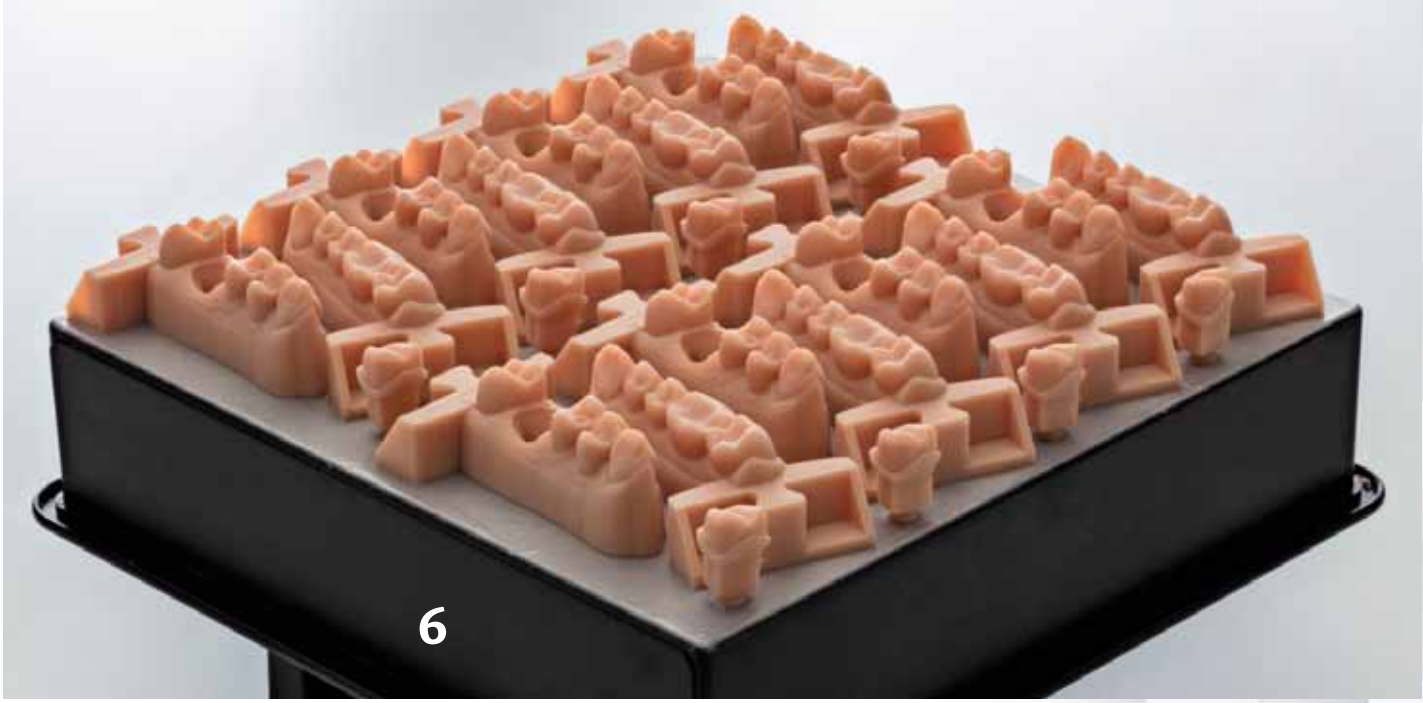
Many clinicians rely upon a dental mirror to assess the clinical fit of a restoration, visually inspecting to see if there is any marginal discrepancy (**Figure 5**).

Taking many of these factors into consideration, research has established that the fit discrepancy of an acceptably fitting restoration is between 50–200fflm.[7] Based upon many factors mentioned within this section, many agree that 100fflm is the consensus acceptable discrepancy of what an average clinician would accept as a crown, implant, or restoration fitting or not fitting.[7]

TABLE 1 —

CLINICAL BENCHMARKS FOR MARGIN AND GLOBAL ACCURACY

	CLINICALLY RELEVANT AIM
MARGIN ACCURACY	+-50fflm
GLOBAL ACCURACY	+-100fflm



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TRANSLATING CLINICAL BENCHMARKS TO PRINT SPECIFICATIONS

Based upon these benchmarks for clinical acceptability, we returned to our three measures of accuracy. With a general clinical acceptability of a margin gap of up to 100fflm, an accuracy range of less than half of this would be an acceptable range, i.e., +-50fflm. For contact points, an equivalent range of +-50fflm would also be relevant. Across a full arch, i.e., a distance ranging from 40-60mm, an aim of +-100fflm was chosen. Expressed as a proportion, this would represent +-0.25 percent - +-0.17 percent. (**Table 1**)

EVALUATING 3D PRINTING ACCURACY METHODOLOGY

We set out to evaluate the accuracy and precision of 3D printing crown and bridge models with removable dies on the Form 2 and dental model resin, the highest accuracy resin in the Formlabs resin library (**Figure 6**). As accuracy is material dependent, this choice was deliberately made to see the best possible results.

A total of 148 parts—a variety of die and arch models—were printed directly on the build platform. After printing, each part was removed from the build platform, cleaned with isopropyl alcohol (IPA), post-cured for 60 minutes at 60° C in a UV cure chamber, and optically scanned using a 3Shape D900L desktop scanner. Each model scan was compared to its original STL file using Convince Analyzer (3Shape).

Accuracy tolerances corresponding to the 80th surface percentile were measured. Surface percentiles represent the proportion of points on the surface of interest that are within a given distance from the nominal, i.e. desired, position. Thus, an accuracy tolerance of +- 38fflm for the 80th surface percentile translates to 80 percent of the surface being within +-38 fflm of the nominal surface.

This process was performed over a representative set of six different Form 2 printers. Using a broad set of Form 2 printers allows us to comment on the population as a whole—on the precision—rather than just performance on one machine. (**Table 2**)

THE TWO GOLD-STANDARDS OF PROPER RESTORATION FIT ARE TACTILE FEEL WITH AN EXPLORER INSTRUMENT AND VISUAL ASSESSMENT WITH A RADIOGRAPHIC IMAGE.

TABLE 2 —

MARGIN AND GLOBAL ACCURACY RESULTS

	REFERENCE OBJECT	CLINICALLY RELEVANT AIM	80th percentile results		
			100 Micron Print Settings Results (+-fflm)	50 Micron Print Settings Results (+-fflm)	25 Micron Print Settings Results (+-fflm)
MARGIN ACCURACY	Removable die	+-50 fflm	+-64.2 fflm	+-44.7 fflm	+-30.5 fflm
GLOBAL ACCURACY	Full arch model	+-100 fflm	+-149.6 fflm	+-104 fflm	+-67.9 fflm

MANY THIN LAYERS EQUATE TO SMOOTHER, MORE DETAILED SURFACES.

The results of the study provide strong evidence that printing at 50-micron or 25-micron settings will yield clinically acceptable models.

At 100-micron layer thicknesses, margin and global accuracy results were outside of our initially defined bounds. However, once again considering the variability in clinical acceptance and testing methods, it is interesting to note that these are likely within a range that would be clinically acceptable for many users.

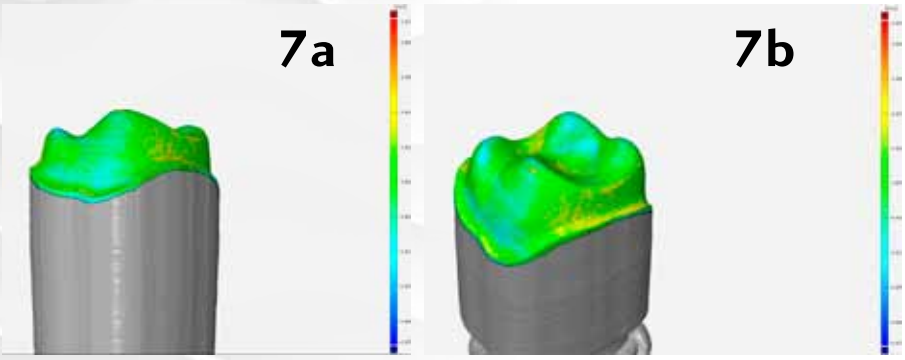
At 50-micron print settings, the margin accuracy is within our defined aim for margin accuracy, and the global accuracy measured across the sample dataset fell just outside the range at +- 104fflm. Taking into account the standard deviation of these measurements, this is virtually in range and is likely of zero clinical significance. Therefore, it is evident that printing at 50-micron layer thicknesses will achieve acceptably accurate models for crown and bridge model purposes.

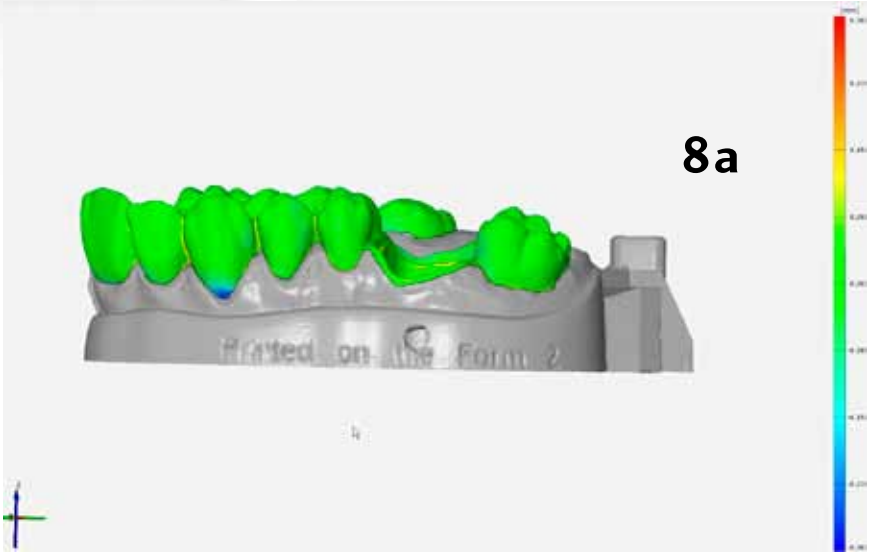
At 25-micron settings, the highest level of accuracy is achieved, both in terms of margin and global accuracy. While achieving high-performance metrics like this may be attractive to some clinicians, it is important to note that these are far beyond the initially defined aims, and the difference in performance with printing at 50-micron layer thicknesses is likely of zero clinical significance.

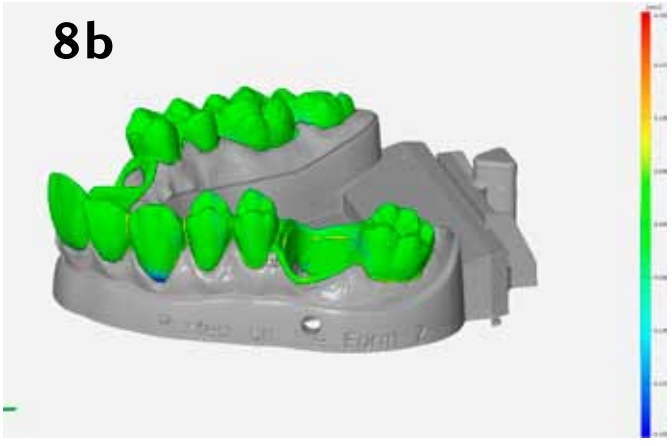
This pattern of increased accuracy when printing at thinner layer thicknesses is due to the way 3D models discretize into layers for a 3D printer to print. When a part has any angled edges, which are not directly on the Z-axis or XY plane, the thickness of the layers determines the number of discrete points the edges of the part hit. Fewer, thicker layers result in a stepping effect—creating longer distances between discrete points. Many thin layers equate to smoother, more detailed surfaces, which will hit more discrete points, and, therefore, measure closer to the scan, making the part more accurate (**Figures 7a-7b, 8a-8b**).

Figures 7a-7b
Accuracy of print to 3D model: margin lines and die surfaces

Figures 8a-8b
Accuracy of print to 3D model: full arch



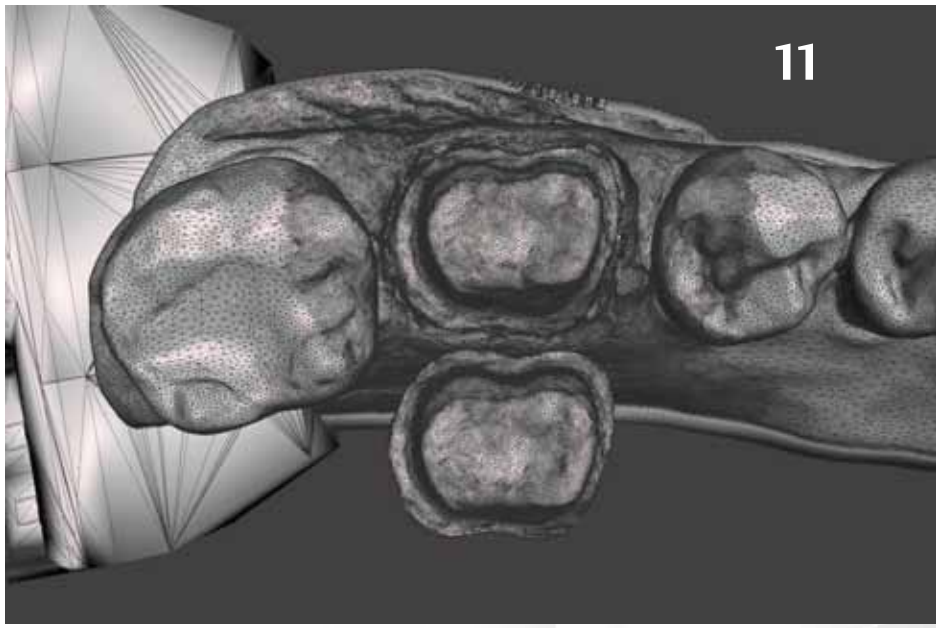




CASE STUDY: MANDIBULAR CERAMIC CROWN

A 52-year-old patient presented the concern that he chipped one of the back molars. A clinical examination revealed a fractured distolingual cusp on the lower right first molar (tooth No. 30) (**Figures 9-11**). A radiograph was made confirming no caries were present and the patient requested a ceramic crown.

Topical and local anesthetic was placed. The crown was sectioned and removed utilizing a diamond bur and gentle manipulation. The preparation was refined, the cord was placed, and an optical impression was made. The optical impression system allows the clinician to reliably fabricate a digital model of the patient's preparation,



dentition, and surrounding soft tissues. Further, scans of the opposing and bite were completed. The digital files were sent to a dental laboratory for further procedures. A provisional material was fabricated, cemented, and the patient was scheduled for the crown-seat procedure.

The files were received and the models were imported and designed using dental CAD software. Three files were generated:

1. A model of the opposing dentition.
2. A model of the preparation with a recess corresponding to a ditched die.
3. A model of the ditched die of the preparation.

Each file was individually printed on a Form 2 3D printer using Dental Model Resin on 50-micron layer thickness settings. Each of the models was finished using Formlabs Finish Kit, with staged rinsing in 91 percent isopropyl alcohol (IPA) followed by UV curing in an industrial curing machine.

The models were printed with articulator features, allowing the laboratory technician to physically articulate the models and verify occlusion of the restoration. A pressed lithium disilicate crown was fabricated and fitted to the model, verifying contacts to adjacent teeth and marginal integrity.

The patient returned for final clinical procedures. No anesthetic was required, the provisional was removed, and the preparation was cleaned prior to bonding. The restoration was tried in, verifying contacts, marginal adaptation, and esthetics. Using the established dental industry workflows combined with Formlabs Dental Model Resin, minimal adjustments were required, as the restoration fit with incredible precision. The crown was luted using resin cement, and a radiograph was made to verify that all of the cement was properly removed. Occlusion was verified, and the restoration was polished. The patient was extremely comfortable and very pleased with his new restoration.

The growth in adoption of affordable, desktop 3D printing systems offers the potential for major change in the dental industry. The potential for such printers to be used to reliably print dental models for checking high accuracy restorations provides significant opportunity to reduce production times and costs.

THE GROWTH IN ADOPTION OF AFFORDABLE, DESKTOP 3D PRINTING SYSTEMS OFFERS THE POTENTIAL FOR MAJOR CHANGE IN THE DENTAL INDUSTRY.

The results of this study demonstrate that it is possible to produce highly-accurate, precise dental models with removable dies on the Formlabs Form 2 with Dental Model Resin. Prints made at 50-micron and 25-micron layer thicknesses on a representative sample of Form 2's are well within the range of clinically relevant accuracy, both in terms of accuracy of the margin line and die surface, as well as global accuracy.

The capability to produce high accuracy dental models in-house, to the necessary clinical standards, represents a huge opportunity for dental professionals of all kinds, solving many of the problems associated with traditional production methods, breaking previous barriers to adopting digital fabrication, and overall simplifying clinical and laboratory dentistry procedures.

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EDITOR'S NOTE:

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By Bill Warner

Partial Dentures: A Comprehensive Guide

When correctly designed, a partial denture can provide a stable way to replace one or more missing teeth. This option is cost-effective and is suitable for patients where existing fixed-bridge work may have failed due to recurrent tooth decay. This can also happen when implants are not an option due to financial or clinical constraints.

It is important to strike a balance between esthetics and comfort.

A partial denture design can be chosen to protect existing teeth and periodontal tissues and to maximize esthetics (**Figure 1**). It is important to strike a balance between esthetics and comfort, although, a partial denture that concentrates wholly on a patient's appearance may not provide the best comfort or functionality. This could result in the patient not wearing the appliance at all.

Patients who are particularly concerned about their appearance generally prefer clasps that are not highly visible. Thanks to the introduction of newer, more flexible nylon materials that are particularly suitable for the construction of partial dentures, this is possible. An alternative option is to use precision attachments, where a rigid removable partial denture is attached to fixed bridgework or to a fixed crown. This can help avoid the need for highly visible clasps while protecting abutment teeth and potentially promoting improved periodontal health and better patient comfort.


1

Materials Used for Partials

Although skills and experience are vital when designing and fabricating a partial prosthesis, the choice of dental materials is equally as important. Partial denture materials can be classified as non-metallic, using materials like acrylic resins and vinyl resins. They may be metallic, using metals like cobalt chrome or gold alloys.

Ideally, the materials used to fabricate partial dentures should have several key attributes. They must be biocompatible, should have good esthetics and must have a high bond strength with denture teeth. The materials chosen should exhibit adequate mechanical and physical properties that can withstand functional and para-functional masticatory forces. As partial dentures are removable, they must be able to withstand a reasonable amount of shock, for example when subjected to general abuse during everyday chewing.

2

Acrylic Resin

Acrylic resin (polymethyl methacrylate) is formed by mixing methyl methacrylate monomer (liquid) with methyl methacrylate polymer (powder) that is heat-cured in most cases (**Figure 2**). Choosing this material produces good esthetics and acrylic resin has good dimensional stability, providing adequate retention and stability for the finished partial denture. It is odor-free and taste-free and has good color stability. The material is reasonably resistant to bacterial growth and stains, and it has low thermal conductivity. Despite the benefits of using acrylic resin as a base for a partial denture, this material does have poor strength characteristics, in particular, low fatigue resistance and low impact strength. It can fracture when exposed to excessive shock or forces. Often an acrylic partial denture will break or crack if dropped by the wearer. Acrylic resin can be strengthened in various ways using filler and fiber or using graft copolymers with high impact resins.

Nylon

Flexible removable dentures are nearly unbreakable. These are made from a type of nylon that was originally introduced into dentistry during the 1950s (**Figure 3**). The nylon material is technically known as a super polyamide. These flexible resins are strong, durable, and have thermoplastic qualities. The material can be injection-molded into flexible denture bases to which replacement teeth can be attached. Clasps are constructed from the same flexible material, discreetly holding the denture in place. With nylon, patients gain the advantage of having a thin yet flexible partial denture, creating a user-friendly appliance that is especially suitable for people with allergies to acrylic resin. Once in the mouth, the nylon base is quite difficult to see, providing patients with an esthetically pleasing appliance.

3

However, fabrication using injection casting is technique-sensitive, as it is vital to consider the position and size of sprue placement. The most well-known maker of nylon dentures is Valplast®.

Cobalt-Chrome Alloys

The cobalt-chromium alloys used for partial denture fabrication are composed mainly of cobalt and chromium, while minor elements include nickel, molybdenum, carbon and silicon and manganese. Cobalt and nickel provide good strength and hardness, although many people are allergic to nickel, which is why this element is interchangeable with cobalt. Chromium is tarnish and corrosion resistant. Silicon and manganese increase the fluidity of the molten alloy and molybdenum is a grain refiner. This alloy is low-cost, stain-resistant, high-strength and resistant to wear. Cobalt chrome is very biocompatible and resistant to corrosion while providing the necessary strength and rigidity required for partial dentures, all without the need for a heavy and bulky framework. It is also strong enough to be used for clasps.

Gold Alloys

Gold alloy can provide an excellent fit and flexibility when used to construct a removable partial denture, but is not often used due to the high price of this material.

Ideally, the materials used to fabricate partial dentures should have several key attributes.

Types of Partials

Each type of partial denture is carefully designed by experienced technicians. Choosing the right one means you and a patient will need to consider many important factors. Every partial denture is made to be comfortable enough to wear daily while providing maximum retention, good functionality, and proper esthetics, even in the most demanding of situations. All partial dentures support life-like artificial teeth, which are chosen and arranged to complement the patient's facial structure, skin tone, and gender. In the end, the goal is providing superb dental care while creating a look that is uniquely individual and closely emulates the appearance of natural teeth.

Cast Metal Elite Partial

A Cast Metal Elite Partial has a high-quality, lightweight metal framework that is cast from Dentsply Vitallium 2000 Plus (**Figure 4**). This premium cobalt chrome alloy exhibits superior strength, is free of nickel and beryllium, and has a high yield and tensile strength that makes it particularly resistant to fractures and deformation. The material has a Vickers hardness that is less abrasive for opposing dentition. It also has a high surface luster that helps resist plaque buildup. Partial dentures fabricated with this material are smaller and more comfortable for patients and are easy to clean and maintain. The framework is finished with durable and lifelike acrylic that is available in a comprehensive range of shades.

4

Valplast® Flexible Partial

Known as the original flexible denture, Valplast® flexible dentures have been used since the 1950's, providing patients with an alternative to cast metal, rigid removable partial dentures (**Figure 5**). These partial dentures have a flexible resin base that may be used for partial dentures or for unilateral dentures. Valplast® flexible partials are made from an injection-molded biocompatible nylon and thermoplastic resin. The material is monomer-free and hypo-allergenic.

Valplast® provides a degree of flexibility that conforms to the shape of the patient's mouth while still being stable enough for a partial denture. Unlike regular acrylic resins that are formed from mixing a polymer and monomer, this thermoplastic material is manufactured in sheets, pellets, or powder. Once introduced to heat, the plastic softens so it becomes flexible enough to be injected into a mold. This merely changes its physical shape without causing any chemical changes, retaining the overall flexibility of the material.

5

This flexibility also helps to distribute masticatory forces over the supporting ridge, keeping these forces from becoming focused on individual support points. By evenly distributing masticatory forces, a Valplast® partial denture may last longer without the need for frequent relines, which are often required with conventional rigid partial dentures.

Valplast® partial dentures are ideal for patients with acrylic allergies or for those looking for a more esthetically-pleasing and comfortable solution. The color, shape, and design of the base material can blend seamlessly with the gingival tissues, creating a prosthesis that is nearly invisible. Strong and durable clasps can be made from the same material, avoiding the need for more traditional cast metal clasps. This may be ideal for patients who have previously complained about the metallic taste that is sometimes associated with a metal framework.

If required, however, Valplast® partials may also be fabricated with a cast metal framework, providing patients with the best of both worlds. The cast metal

framework gives additional strength and stability without the need for metal clasps. Although this decreases the flexibility of the prosthesis, it can still produce excellent esthetics when combined with Valplast® clasps. The flexible base material carries a lifetime guarantee against breakages during normal use. If needed, Valplast® partial dentures can be rebased or may have additional teeth added if or when modifications are required.

CustomFlex Flexible Partial

Similar to Valplast®, a CustomFlex partial is made from a strong, nylon-like thermoplastic material that is injection molded (**Figure 6**). Choosing this material for your patients will provide them with a flexible and comfortable partial denture at a lower cost compared to brand-name flexible partials. The material used in a CustomFlex flexible partial is biocompatible and suitable for patients with acrylic allergies or sensitivities. It is virtually unbreakable, with clasps made of the same material. The base material is highly translucent and is carefully characterized to create natural-looking tissue that closely mimics the shade and tone of the patient's oral tissues. A CustomFlex partial denture is thin and easy to wear, providing patients with increased comfort and confidence when smiling, speaking, and eating. The material is suitable for the fabrication of all partial dentures and can be used in conjunction with a metal framework base with flexible clasping and saddles. CustomFlex partials are a good choice for patients looking for a cost-effective alternative to top brand-names without compromising on quality. The base material is available in pink, light pink, medium, dark, and clear.

Acrylic Partials

Acrylic partial dentures are made to be supported by the mucosa and are designed to ensure good gingival health (**Figure 7**). They can be fabricated with wire retention or with metal clasps, or they can be entirely metal-free. The exact design will depend on whether they are made for temporary use or if they will be used as a more permanent prosthesis. Quite often acrylic partial dentures are fabricated purely to help maintain appearance while tissues are healing. They can help to stimulate the underlying tissue so it becomes conditioned to providing support, creating a more permanent removable partial denture.

6

7

8

An acrylic partial denture may be used as a space maintainer or to help re-establish occlusal relationships. Immediately after tooth extractions or traumatic loss of teeth, a temporary acrylic partial may be prescribed to prevent unwanted tooth movements until a more permanent partial denture can be fabricated. They can also be useful in helping patients to become accustomed to wearing a denture, particularly when periodontal and oral health is poor and when complete tooth loss is inevitable. Generally, acrylic partial dentures have an open design, helping to maintain good oral hygiene. When worn for a short period of time, they create minimal damage to the supporting and surrounding tissues. However, they tend to be structurally weaker compared to other types of removable partial dentures.

Unilateral Partials

Conventional partial denture design is bilateral, consisting of some form of connector that will bridge both sides of the arch (**Figure 8**). This design is very stable, but cannot be tolerated

by some patients who are unable to wear such an extensive appliance. A unilateral partial denture may be a good option for patients who are unable to receive bridge work or implant-retained restorations. Unilateral partial dentures may be fabricated from flexible materials such as Valplast® or CustomFlex. Using a flexible framework helps prevent the possibility of damage to the digestive system in case the unilateral partial denture is accidentally swallowed. A unilateral denture is sometimes called a Nesbit partial.

Cast Metal Elite partial dentures are designed to be strong and rigid, resisting deformation that can be caused by complex stress fields during normal mastication. These dentures are particularly suitable for people with good oral hygiene and the motivation to wear a partial denture. Ideally, there should be an even distribution of abutment teeth as well as adequate bone support.

One of the major advantages of choosing a Cast Metal Elite partial is that its high strength and rigidity allows for the construction of a less bulky, lighter, and smaller partial denture. When properly designed and cast, this denture retains optimal flexibility so clasps can fully engage undercuts, gaining maximum retention from teeth. This type of denture can provide years of use and is relatively easy to mend or adjust if required.

The main disadvantage of choosing this type of denture is high visibility. The metal clasps must be optimally positioned to offer good retention and stability but, unfortunately, this may mean the clasps are highly visible in the mouth.

Flexible partial dentures such as Valplast® and CustomFlex are extremely popular with patients. They are marketed as being virtually unbreakable, permanent, and retentive restorations. While the initial costs can be quite high, many people feel the cost is worth it for a denture that offers better esthetics. The base material of a flexible partial denture can flex to adjust to the contour of the patient's dental arch, even when the fit has become less than perfect due to the changing shape of the alveolar ridge. The flexible nature of the material can produce a slight movement during mastication, which can help to stimulate the gum and bone tissues, preventing deterioration. When it comes to flexible dentures, the advantages are:

1. **APPEARANCE -** There's no denying that flexible dentures look good. The denture base and clasps are made from the same flexible material, which offers a good degree of translucency, so this prosthesis blends in well with the natural tissues.

2. **COMFORTABLE TO WEAR -** Flexible dentures offer a high degree of comfort, even if the denture is ill-fitting. This is due to the excellent flexibility of the thermoplastic material. The nylon base can be relatively thin, increasing patient comfort and the flexibility of the material makes them easy to insert. Although flexible dentures can be relined, it is rare for this to be necessary. The flexible nature of the material allows it to conform to subtle changes to the shape of the mouth. Small adjustments to the fit of the clasps can easily be completed chairside.

3. **GOOD RETENTION -** The flexible nature of this material allows it to relax into natural undercuts, increasing retention without creating unwanted pressures.

4. **PATIENT COMPLIANCE -** Often partial dentures remain unworn because patients are unhappy with highly-visible metal clasps. Patients may also simply find them too uncomfortable to wear. Patients are more likely to wear a flexible denture that is discreet and comfortable.

There are, of course, disadvantages as well:

1. **LACK OF COLOR STABILITY -** Patients must be careful to properly maintain their flexible denture because the color of the base is not as stable as conventional acrylic resin partial dentures. Without the correct care, the denture base can discolor.

2. **FLEXIBLE DENTURES MAY REQUIRE MORE SPECIALIZED REPAIRS -** While clinicians can complete small adjustments chairside, any saddle, tooth, or clasp additions must be carried out by a dental lab using suitable flexible resins. Any repairs or adjustments required will generally take longer because of the need to send the dentures to the dental laboratory for specialist repairs.

3. **Sore Spots Are Possible -** The lack of tooth support for flexible dentures can result in movement when forces are applied to the denture. Over time, this can cause recurring sore spots. This movement may also make it more difficult for patients to eat harder foods.

While Valplast® is the market leader in flexible nylon dentures, CustomFlex is a material of equal quality. With CustomFlex, patients gain all the advantages of a flexible denture, but with a more cost-effective price.

When choosing their partial denture, patients need to be aware of all possible pros and cons. For some, a flexible denture will be the obvious and most desirable choice, especially when esthetics are a particular concern. The unbreakable nature of this material also greatly increases its appeal. A flexible partial denture can be a good choice when it is necessary to place clasps in visible areas. Strengthening a flexible denture with a cast metal framework might be a good solution where additional denture strength is required.

However, sometimes a more rigid cast metal partial is preferable. This is often

the case when it is possible for the partial denture to be designed to include more discreetly-positioned clasps without affecting stability, flexibility, and strength. A flexible partial denture cannot always offer optimal retention and stability, and will not have the same peripheral coverage that can be achieved with a rigid Cast Metal Elite denture. Sometimes a flexible denture can only be designed in such a way that it traps food particles around its edges. If this is the case, it's preferable for the patient to have a cast metal appliance.

Patients need to be aware of all the possible benefits and drawbacks of each option so that, after discussion with their clinician, they can make an informed choice that suits their needs for years.

Manufacturing Process

When fabricating partial dentures, we always consider support, retention, and stability to be the most important outcomes. This should be combined with a design that makes it easy for a patient to maintain decent levels of oral hygiene. Partial dentures must be constructed to help masticate food while being cosmetically pleasing. Patients wearing partial dentures should be able to maintain normal speech and good oral health, with the partial denture preventing tilting and over-eruption of natural teeth. A good partial denture design won't just fill in the gaps, but will instead be constructed in a way that minimizes damage to the oral tissues.

To fabricate a partial denture, you need high-quality study impressions, accurately recording the remaining teeth, edentulous areas, palate, and the sulci. These impressions are poured in stone and occlusion may be initially studied. Ideally, where occlusion is easily determined, models are mounted on an articulator. If occlusion cannot be determined, wax bite rims are constructed for the occlusion

to be accurately recorded, and the exact position will depend on the natural teeth still present. Unless the occlusion is to be modified in any way, these mounted study models can be compared to the patient's occlusion to ensure they look correct (**Figure 9**).

The design of a partial denture requires the model to be surveyed so the correct path of insertion can be identified in relation to tooth and bone undercuts, guide planes, and appearance. Parallel lines are marked on the model, and a framework can be designed to outline the saddle and occlusal areas, as well as any additional support that is necessary to prevent rotation. It's essential to plan resistance to lateral and anteroposterior displacing forces, and connections must be rigid, providing sufficient strength with minimal gingival coverage. If any tooth alterations are necessary, these should be noted on the model. Undercuts positions that will be engaged by clasps arms should be indicated on the cast, while the type of clasp and required material should be included in the prescription. Any alteration processes necessary to improve the design should be noted on the prescription.

Surveying the model and designing the partial denture is completed with the clinician, working closely with our technicians to help enhance the success of treatment. The laboratory should receive a comprehensive prescription, including a design and written instructions. Preferably, a design will be drawn on the study cast. Once all tooth preparations and restorative procedures have been made according to the treatment plan, it's essential to verify that there is sufficient clearance for the components and for the denture base.

If a new impression can be taken, it should be completed using a special tray (**Figure 10**). Prior to the impression being taken, large interdental spaces underneath contact points should be blocked out in the mouth. Ideally, this impression should be taken using dimensionally-stable materials. If alginate is chosen, this should be poured immediately, preventing distortions. When our dental lab receives this impression or model, the material is carefully examined for defects and used to create a master cast, as well as duplicate master casts. To do this, the cast is surveyed using the path of insertion, which is indicated by the clinician on the primary casts. Undercuts are blocked out, and the cast is duplicated. Wax bite rims can be seated, using the duplicate master cast. Using these registration rims, the master casts can be mounted on a suitable articulator.

The metal framework will be constructed on an investment-model master cast, which is made once the master cast has been prepared. The framework is manufactured to the exact prescription received from the clinician and is designed to fit accurately with no sharp edges, all while ensuring any clasps arms do not affect the mucosa and fit precisely into undercuts. The non-fitting surface is highly polished and will be returned for a try-in. Once tried in the mouth, any minor errors can be detected using disclosing material and corrections made to ensure the framework fits perfectly. At this stage, the occlusal relationship can be examined again and if necessary, minor alterations can be made, although care needs to be taken to retain a minimum thickness at rests and connector junctions to avoid possible fractures.


10

An occlusal rim may be added to the framework to accurately record the jaw relationship. At this point, the shade and mold of denture teeth can be selected. Once the framework is returned to the lab, a trial partial denture will be fabricated.

This can be tried in the mouth to check appearance, speech, and occlusion, as well as gain patient approval for the trial denture. If no further modifications are required, the trial denture can be processed and finished, and the master cast can be mounted on the articulator to check the occlusal relationship once more. This can also be an opportunity to smooth out any processing imperfections before fitting in the patient's mouth. Apart from removing any surface imperfections, the fitting surface will remain largely untouched. Once completed, the partial denture is thoroughly cleaned and is placed in an antiseptic solution to maintain the water balance and to prevent infection. The denture is returned to the clinician with the duplicate cast. With the proper design and fabrication, minimal adjustments should be required during the fitting appointment or the subsequent review.

When manufacturing a flexible nylon denture, little or no tooth preparation is needed and rest seats are optional, depending on the clinician's requirements. This is a tissue-borne restoration, which utilizes soft tissue undercuts for retention. A model may be taken using alginate to provide an accurate master model, capturing a good passive-tissue impression. Wax bite rims are essential for good bite registration. The model is surveyed for design and for clasp positioning, a procedure that highlights existing undercuts and soft tissue ridges that may need to be blocked out. A duplicate model is then made and is mounted using an accurate bite registration. Teeth are set up in the wax try-in stage using the mould and shade preference specified by the clinician. At this stage, the clinician can double-check the shade for accuracy, and the try-in can be assessed for appearance, occlusion, vertical dimensions, and midline. Once returned to the dental lab, any minor adjustments are made, and the partial denture is processed by injection-molding the material, with pressure, temperature, and time being carefully controlled during this procedure.

About the Author

Bill Warner is director of clinical relations for DDS Lab, Inc. He has more than 35 years of dental laboratory experience as a technician, supervisor and laboratory owner. He is an expert in all phases of fixed prosthetics, including product selection and planning for the most complex cases.

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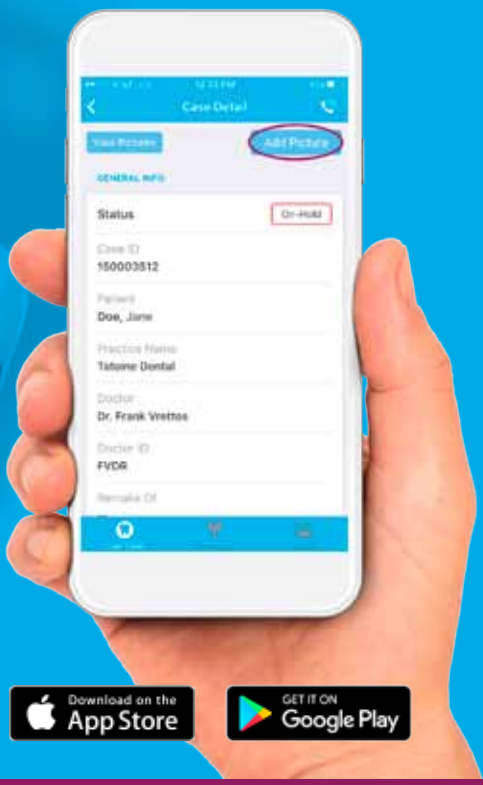

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For more information and to apply, please visit www.dentallabfoundation.org/scholarshipsgrants/pillar-scholarship. Questions? Contact the Foundation office at (866) 627-3990 or email foundation@dentallabfoundation.org.

Team Solutions Dental Lab Opens New Facility

Team Solutions Dental Lab in Oviedo has begun the transition into a new state-of-the-art manufacturing facility, with more than 400 percent the space of its previous facility. The transition is expected to be completed by the first of the year, making it the largest dental lab in Central Florida. The new facility has been completely re-envisioned to support the growing need for digital dentistry in the region. The new facility includes a dedicated in house milling center, 3D printing center and chairside consultation team, as well as conference, training and administration centers. Team Solutions Dental LLC, was founded in 2013 with 1 employee, has grown to 46 employees in 4 years. The lab serves a client base of over 200 local and regional dental practices.

NADL University

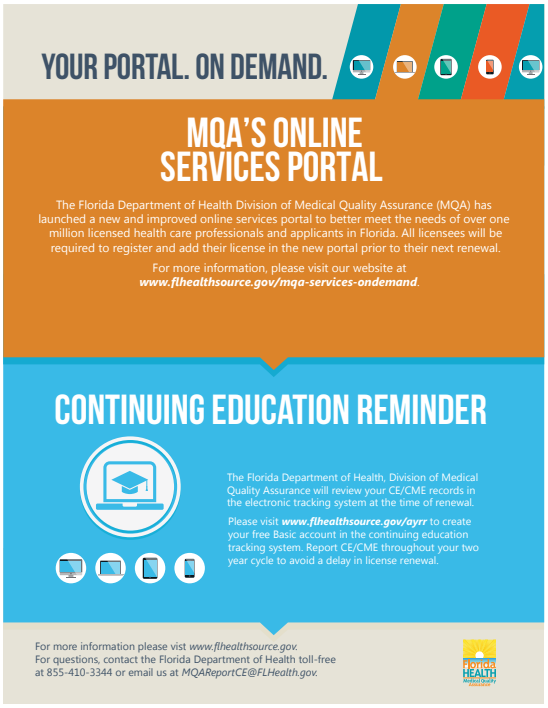
Mark your calendars for the 2018 NADL University program. This 3-day, intensive course was developed to meet the business needs of today's dental laboratory managers. Participants gain an advanced level of knowledge about diverse aspects of laboratory management. Topics include Purchasing and Inventory Control, Human Resources Management, Marketing and Chair Side Services, and so much more! The 2018 NADL University program will be held September 20-22, 2018, in Tempe, AZ. Visit www.nadl.org/events/nadl-university to learn more about eligibility criteria, download the registration brochure, and find out about possible grant opportunities.

"I have been in this industry for 25 years and this was by far the best course I have ever attended! The courses covered all of the most common issues that lab owners and technicians face on a daily basis. It was very informative and an all-around awesome experience!"

— Greg Guardiola, CDT, R-dent Dental Laboratory, Inc.

FDLA South Florida Workshop a Success

The 2-day hands-on workshop held on December 1 & 2 in Fort Lauderdale was a great success! We would like to thank VITA North America for sponsoring the session and Marc Wagenseil, D.D., RDT for his presentation, "Freedom in Movement, Understanding Occlusion: An Advanced Denture Setup Course". The attendees were extremely pleased by the program.



Florida Department of Health - Dental Lab CE Rule Change

There is an important upcoming change to your continuing education requirements. Effective January 31, 2018, the Department of Health will accept proof of certification by the National Board for Certification in Dental Laboratory Technology to satisfy your continuing education requirements of Rule 64B27-1.003, F.A.C.

64B27-1.003 Continuing Education Requirements.

(6) Owners or designated employees that are certified by the National Board for Certification in Dental Laboratory Technology as a Dental Laboratory Technician during the biennium can demonstrate compliance with the continuing education requirements of this rule by entering his or her Certified Dental Technician certification number and submitting a copy of his or her active certification card in the CE tracking system.

Additional rule changes to Rules 64B27-1.001, F.A.C. and 64B27-1.002, F.A.C. are effective January 31, 2018. These changes can be found by visiting https://www.flrules.org/gateway/ChapterHome.asp?Chapter=64B27-1

Florida Department of Health Launches New Online Services Portal

The Florida Department of Health, Division of Medical Quality Assurance (MQA) has launched a new and improved online services portal to better meet the needs of over one million licensed health care professionals and applicants in Florida. All licensees will be required to complete a one-time registration in the new portal prior to your next license renewal. Once you are in your account, you will be able to add your license to your account and renew.

Registration and adding your license is a two-step process that takes approximately 5-10 minutes. For more complete instructions, visit www.flhealthsource.gov.

If you need assistance with the registration process, please contact the Florida Department of Health, Board of Dentistry directly at VOIssues@FLHealth.gov or (850) 245-4474.

FDLA

Classifieds

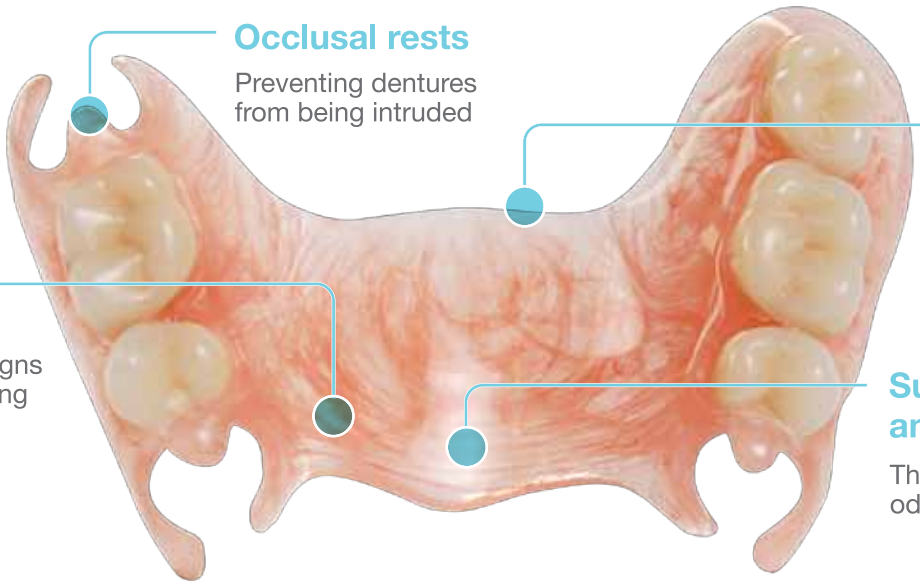
Ceramist: Progressive lab, excellent learning environment, fantastic opportunities to grow

4Points Dental Designs has been providing fantastic smiles in beautiful downtown St. Petersburg, Florida since 2009. “Building value through values” is the cornerstone of our laboratory. For a technician, this means you’ll be able to create amazing restorations with the patient in mind, rather than working to meet a high volume quota. We’re a small but growing lab, striving to do things the right way for the right reasons. 4Points is led by a former AACD Accredited Technician whose experience includes 7 years in-house at the clinical practice of the Dawson Center. We are searching for a full-time ceramist who would like the opportunity to maximize their full potential with an above-average salary in a stimulating work environment. 4Points is located in the heart of downtown St. Petersburg just minutes from the white sand beaches of Florida’s Gulf Coast. St. Petersburg has been listed in Best Places to Live (Coastal Living), America’s Hottest City (Huffington Post), and Best Underrated Food Cities on the East Coast (USA Today). The city is home to numerous microbreweries, innovative restaurants, and a growing art scene. MLS Soccer will soon be across the street, Major League Baseball is a 5 min drive from the lab, NHL, and NFL just a short hop across beautiful Tampa Bay. The successful applicant will have a minimum of 5 years of experience, be a supportive co-worker, and be passionate about continuing education and professional growth. Salary is commensurate with production and skill level. You bring the head, the hands, and the heart, we’ll take care of the rest. We’ve always believed that if you love what you do, you’ll do it with meaning and passion. Please email resumé to 4pteeth@gmail.com. All inquiries are kept strictly confidential.

Dentone Dental Lab

Retiring: Crown and Bridge, Implant lab for sale in Coral Springs, Florida. Great Opportunity: 3 excellent accounts are looking for talented technician to take over large, very inexpensive space above doctor’s offices. All equipment and supplies for one fair price. Will help with transition. Contact: Dennis Natwick 954-675-6913

Deflex



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Florida Dental Laboratory Association Membership Application

Any commercial dental laboratory registered by the State of Florida Department of Health is eligible. Membership shall be in the name of the laboratory as registered by the State of Florida. The owner, partner or designated representative shall represent the laboratory in meetings and is eligible for elective office and voting privileges. Dental laboratories located outside of the state of Florida may join as an Affiliate member using this form.

Name: _____ ❑ CDT

Laboratory Name: _____ ❑ CDL ❑ DAMAS

Laboratory Owner Name: _____ ❑ CDT

Address: _____

City: _____ State: _____ Zip: _____

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RETURN APPLICATION TO FDLA at: 325 John Knox Road Ste L 103, Tallahassee, FL 32303 OR Fax with credit card payment to (850) 222-3019.

Select Your Level

Check One: ✓

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- ☐ **6-9 Members: $435**
- ☐ **10-14 Members: $535**
- ☐ **15+ Members: $750**

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Please list the name and email address of your employees based on the membership level you chose.
(Please note: the primary contact that you listed above will be included in the total count.)

Name: _____ Email: _____

Name: _____ Email: _____

Name: _____ Email: _____

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Measuring For Success

This May, Rob Gitman, company administrator at Thayer Dental Laboratory, CDL, in Mechanicsburg, Pa., will be helping laboratory owners and managers gain an edge when it comes to success during the Southern States Symposium & Expo with his course on key performance indicators. Gitman's course will review the use of key performance indicators to increase laboratory productivity and profitability. Recently, he sat down with FDLA's *focus* to give readers a sneak peek.

"With key performance indicators, you see where the laboratory is growing..."

Can you define a key performance indicator and explain how you got interested enough in them to put together an entire course about them?

They're really benchmarks. Key performance indicators help a company to see how effectively it is achieving its business objectives. Let's say your benchmark for technician labor to sales is 38 percent. That means that all of your technicians' benefits, wages, payroll taxes, continuing education costs, etc. should add up to only 38 cents of each sales dollar for the laboratory. Once you set your benchmark and you set your number, then you know what your billing has to be every day. That's the key to making a profit. The thing I want to focus on in this course is what an owner or manager needs to look at on a daily and weekly basis to make sure the laboratory is making a profit. With key performance indicators, you see where the laboratory is growing, where there's deviation and where you need to change.

What are three of the biggest things that dental laboratory owners and managers get wrong about key performance indicators?

I don't know that they're doing it wrong. I think they're not taking the time to do it because they're so busy. However, if you come away with one solid idea that helps you manage better after this course, then I've done my job. I'll be sharing things I look at for this laboratory that helped to make it profitable and helped it to grow. They (attendees) can pick and choose which of the KPIs they want to use.

Why are key performance indicators so crucial to a lab's success?

You're supposed to be tying your key performance indicators to business strategies and objectives. If you don't tie all these together and look at things to measure, you can't tweak them over time and achieve your goals.

If you could tell a laboratory owner or manager to do one thing in regards to key performance indicators to increase profitability and productivity, what would it be?

They have to manage their labor to sales ratio. That's the key to all of your profitability right there.

What's the one thing you really hope lab owners and managers get out of your course on key performance indicators?

I want them to have at least one solid, good takeaway that they can put into practice on Monday morning.

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