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Going Digital With Partial

Using 3D Virtual Touch for Greater Accuracy, Consistency and Productivity

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Figure 2



QUIZ

1/2 point CDT
documented
scientific credit.
See Page 7.

Figure 1



Economic factors and the changing reimbursement mix are forcing many patients to look for alternatives to costly dental solutions such as implants. At the same time, many dental laboratories are contemplating the advantages of going digital.

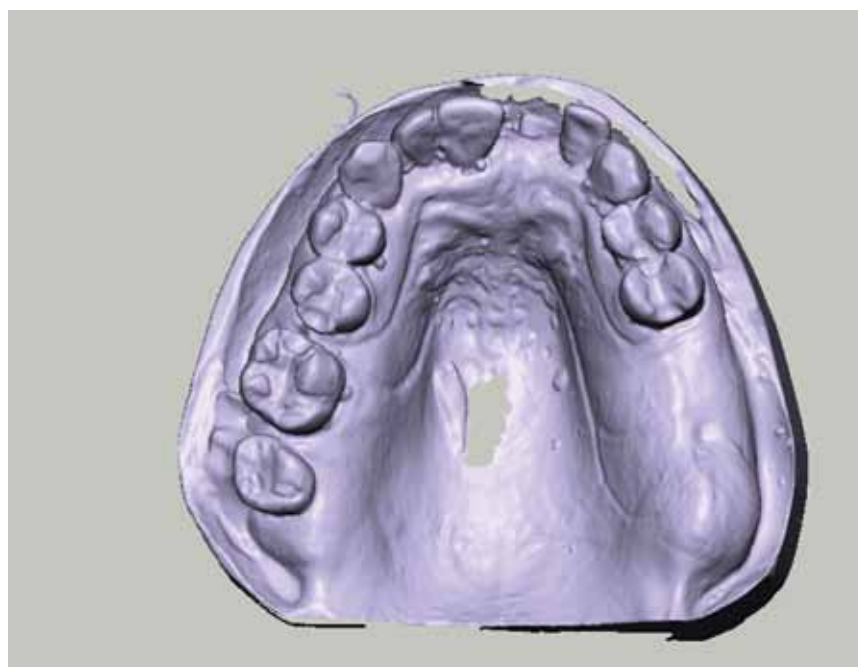
Yet, advances in technology have basically ignored the partial denture category — until recently. With new solutions available on the market today, laboratory owners and technicians can reexamine the challenging art of creating the partial — determining how best to achieve consistent quality and accurate fit, regardless of the operators' artistic ability, while cost-effectively producing removable restorations. The SensAble Dental Lab System addresses the entire scan, design and manufacture process for partial frameworks as well as crown and bridge substructures (Figure 1).

The SensAble system is a complete, integrated solution that uses 3D virtual touch, which is designed to allow technicians to leverage their experience and existing wax-up skills while streamlining the design process. One of the most unique aspects of the system is its use of a PHANTOM® touch-enabled (haptic) device (Figure 2) instead of a computer mouse. This haptic device delivers force feedback, literally pushing back against the user's hand as he or she virtually applies wax to the digital partial seen on screen. Technicians can feel what they see on the screen. Working in this manner is very similar to using traditional wax tools — making it easy to learn and enabling technicians to work digitally

while keeping the manual dexterity and sense of touch to which they're accustomed.

We started this all-digital design process for the restoration pictured by making a scan of the original stone (scannable die stone not required) and entering the case information (Figure 3). Just as in traditional partial design, a good-fitting partial starts with a proper survey. The system

Figure 3



provides a digital approach to surveying and block out that is similar to traditional techniques, making it familiar but much faster. Done manually, this step can take about 20 minutes — but digitally, it only takes about one minute.

As we moved the digital model, the system automatically showed the depth of undercuts using different colors along with the corresponding numerical values — that were quickly adjusted to get an accurate path of insertion (Figure 4). Then, with the click of a button, the system applied blockout wax to a user-defined draft angle and removed undercuts (Figure 5) This enabled us to design with a level of precision and consistency not possible with hand waxing.

Figure 4

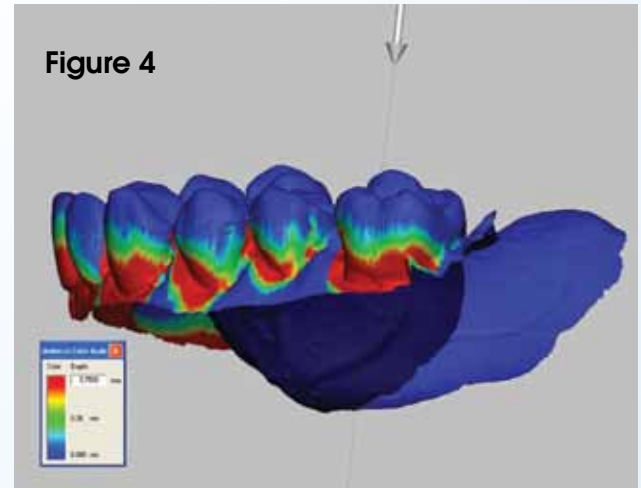


Figure 5

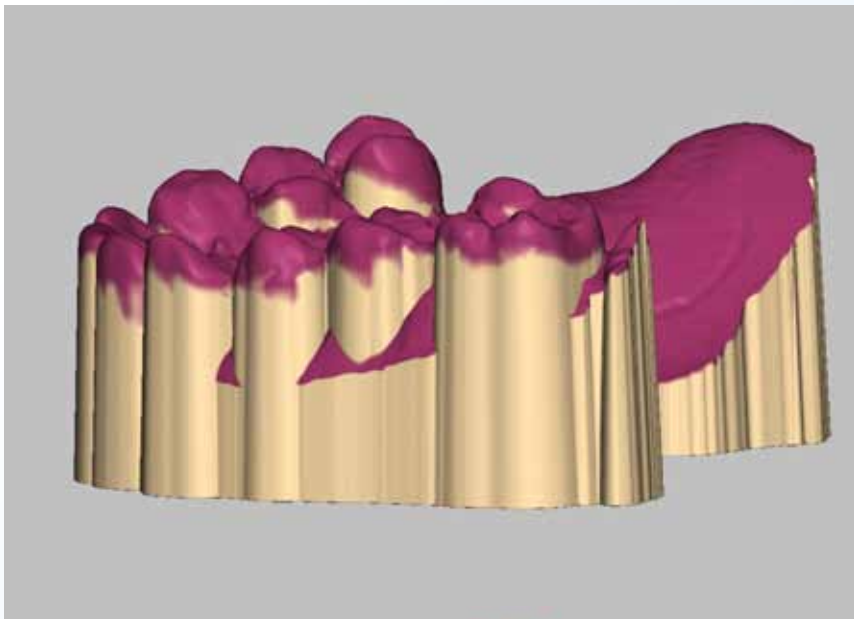
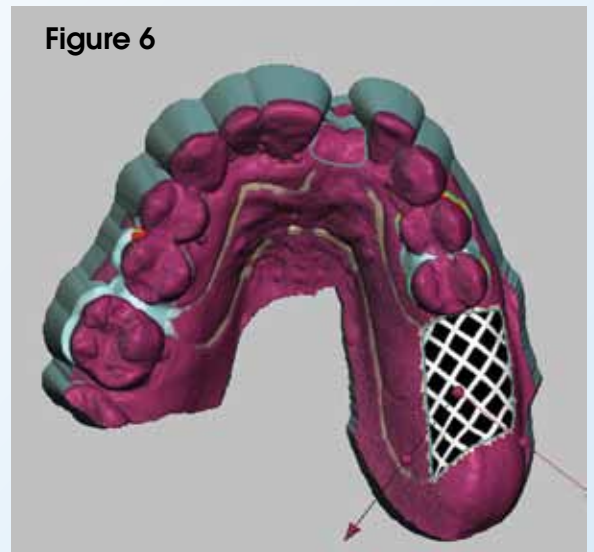
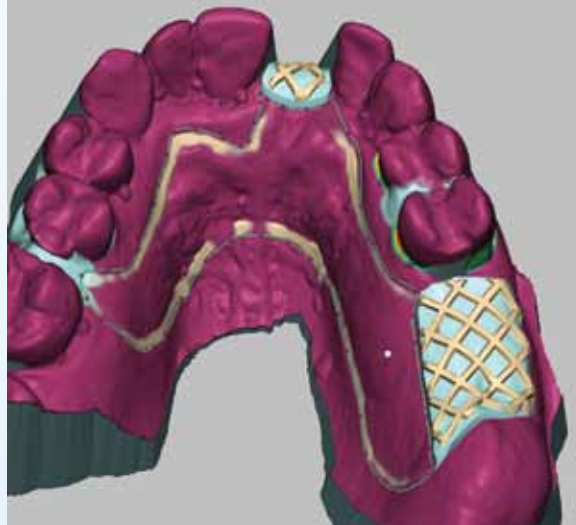


Figure 6



Next, we designed and waxed the mesh area, which the SensAble system allows us to do simultaneously. Using the PHANTOM haptic device, we outlined the shape where the mesh was to be created. We selected one of the system's pre-defined mesh patterns, which can be easily modified. Also, you can add your own mesh patterns to the library if you'd like. The system provides an interactive preview (Figure 6) so we quickly made necessary adjustments. You can modify the position and scale of the mesh and use preset preferences for wax thickness and the relief pad. Thickness preferences can be defined for your laboratory and for your doctors. Then with the push of a button, the mesh and the relief wax are applied to our restoration (Figure 7).

Figure 7



Unlike with hand waxing, the SensAble system clones the palatal surface of the mouth, duplicating the rugae on the tongue side, which maintains the natural anatomy of the palate. This

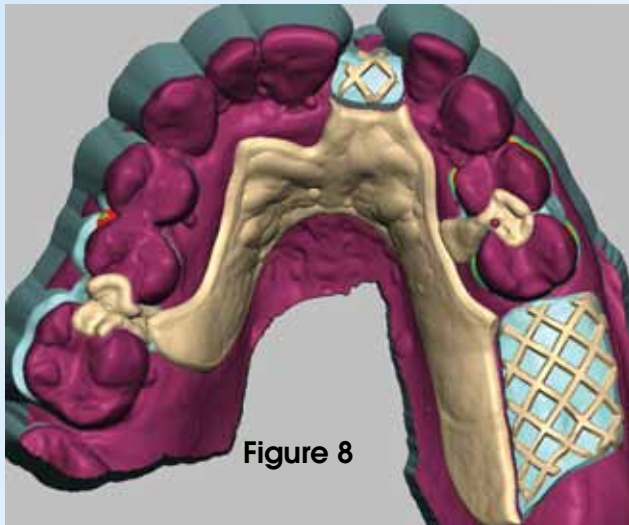


Figure 8

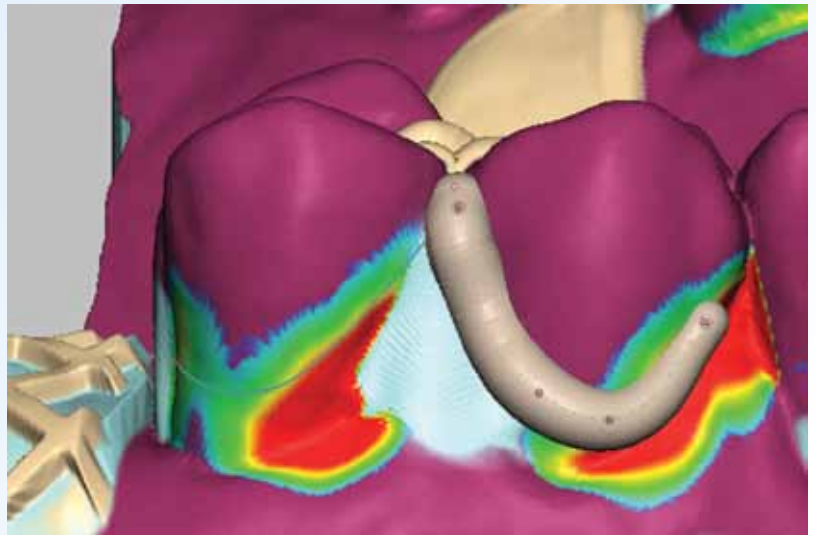


Figure 9

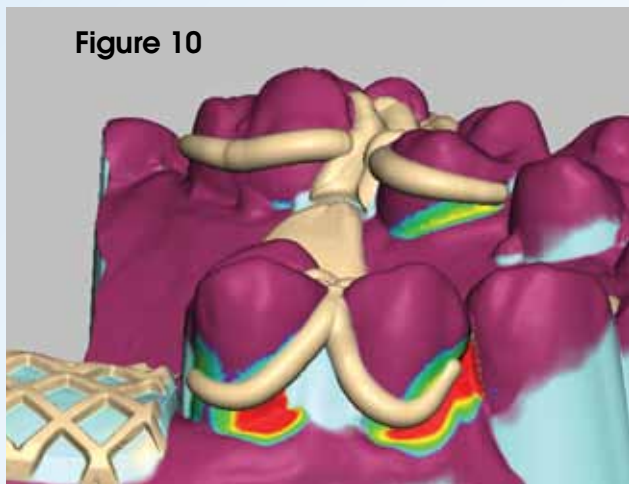


Figure 10

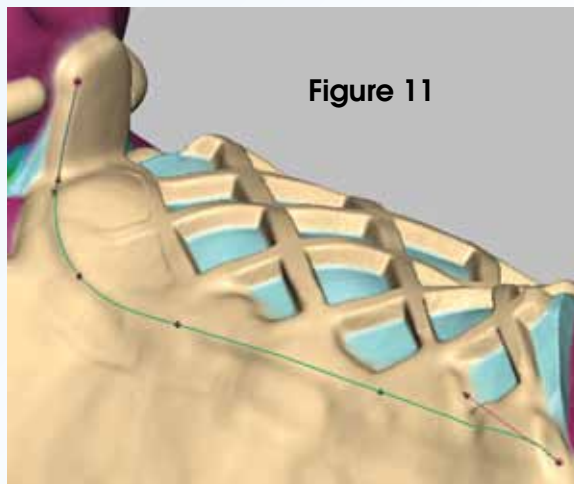


Figure 11

natural anatomy of the palate is vital for proper speech. The system provides a set of digital tools for waxing the major connector and finish line. We outlined the area on our restoration for the major connector and where additional blockout wax was needed. Then, with just two clicks, we added the blockout wax to the digital refractory model. To smooth the digital wax, we used a process similar to working with physical wax and an alcohol torch. Then with another click, we added the major connector. You can do this with either a stipple or smooth pattern that you pre-select from the library (Figure 8).

While crown and bridge restorations have to fit to the margin, partials require far more fit points — clasps, major connectors and rest seats — with multiple adjustments that further complicate accuracy, such as:

- Profile and size of clasps need to be accurate for proper retention.

- Precise surveying of undercuts.
 - Uniform thickness for appropriate strength.
- With the SensAble system, we were working digitally meaning we were able to set clasp profiles and wax thickness. Also, we were able to better ensure consistency and precision by using the system's tools that mask or allow digital wax to be carved away.

We used the PHANTOM, to carve away the blockout wax, just as you do when hand-waxing, to expose the undercuts and drew the center line for clasp placement. We clicked on the line and the system provided an interactive preview of the clasp with control points we could move to adjust the center line (Figure 9). With the system, you can choose any type of profile for the clasp, use pre-set profile shapes and dimensions, or create and save your own. We made final adjustments and when satisfied with the preview, clicked once and the clasp was created in digital wax (Figure 10).

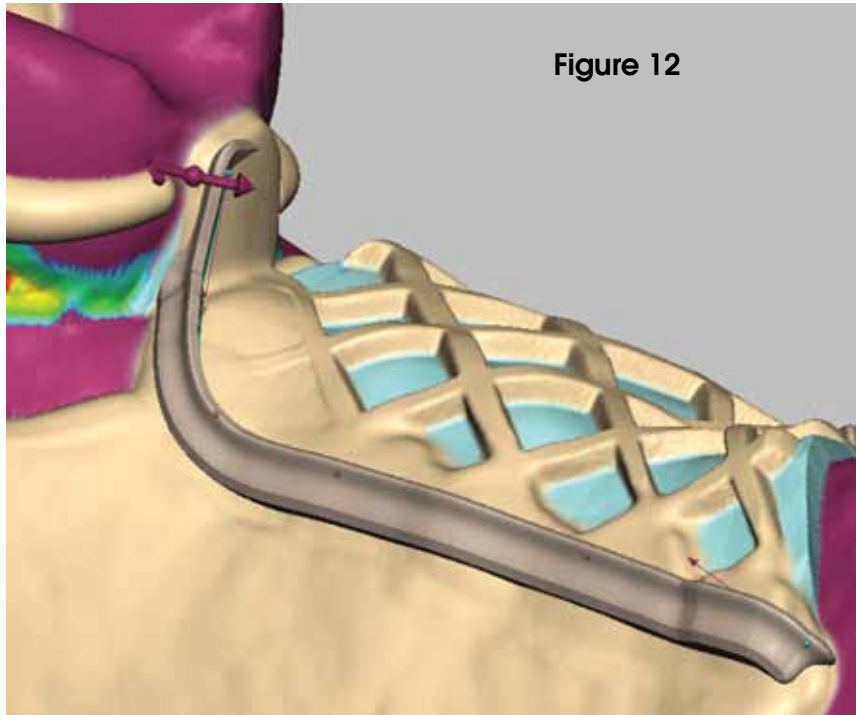


Figure 12

We drew the finish line curve (Figure 11) by actually feeling the edge of the mesh. The system automatically placed the flat side of the finish line profile toward the buccal and provided an interactive preview (Figure 12). We reviewed our design and made final undercut adjustments. If any touch ups are needed when using the system, the technician can smudge and smooth the digital wax to clean up and finalize your design (Figure 13).

For this restoration, our final digital design (Figure 14) was electronically sent to the 3D printer, which uses an additive process to build up thin layers to create an accurate resin pattern (Figure 15). The same 3D printer creates the resin patterns for both partials and crown and bridge. The printed resin part was placed in a temperature-controlled, corn-oil bath to dissolve the support wax and cleaned with soapy water. The part was

Figure 13

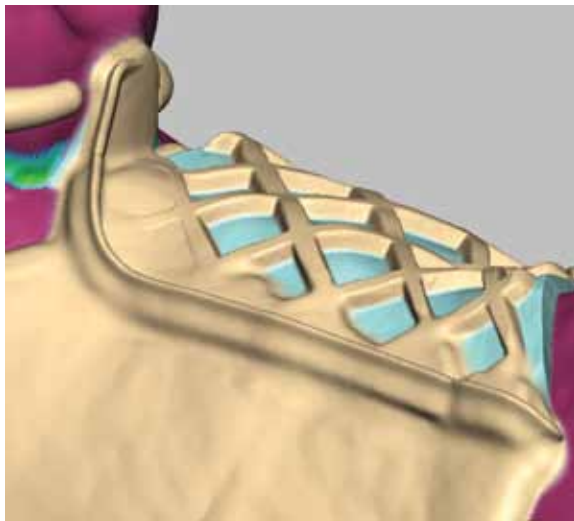


Figure 14

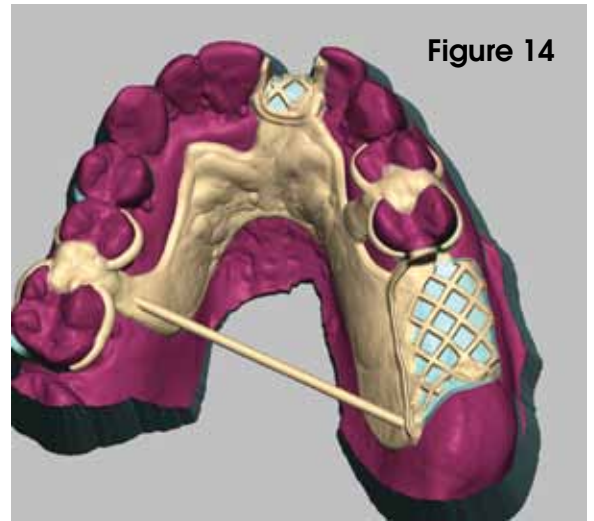


Figure 15



Figure 16



Figure 17

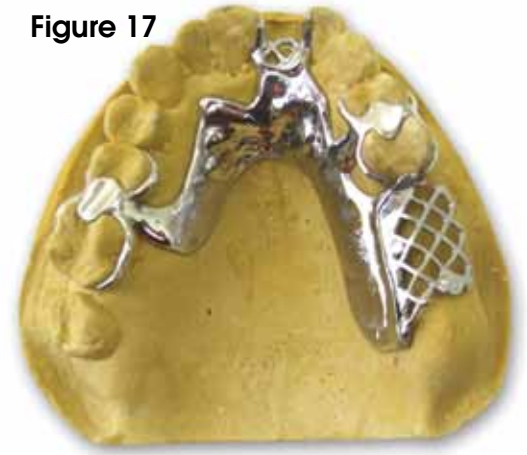


Figure 18

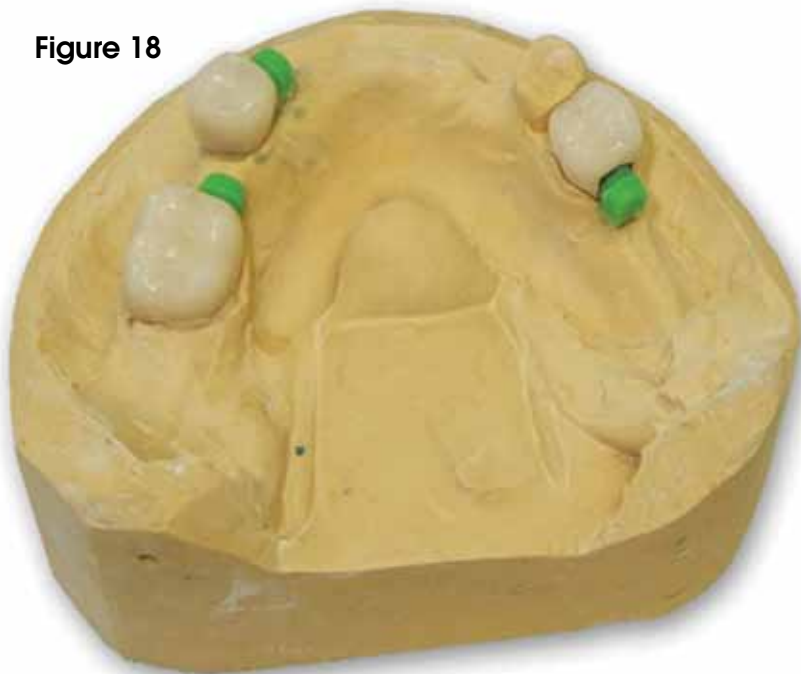


Figure 19



sprued (Figure 16), invested, cast and finished using traditional methods and materials (Figure 17)

Including scan, survey, block out and design, the typical digital partial framework design takes us approximately 35 minutes using the SensAble system compared to 60 minutes using traditional wax-up methods. Substantial money and time was saved by eliminating refractory models and the labor associated with that process. Additionally, because the resin patterns are so precise and uniform in thickness, the finished partials weigh less and our finishing time has been significantly reduced.

In addition the SensAble system provides a versatile digital platform that enables us to also design a number of additional types of restorations including attachments (Figures 18-20), simple cast frameworks (Figures 21 and 22) and cast mesh palates (Figures 23 and 24).

With the SensAble system we are completing digital partials in about half the time, as well as saving time and money with materials. Another considerable benefit of working digitally is that in the case of a remake (miscast or doctor-requested clasp change), modifications can quickly be made to the digital file and reprinted instead of having to hand wax again from scratch.



Figure 20

Figure 21

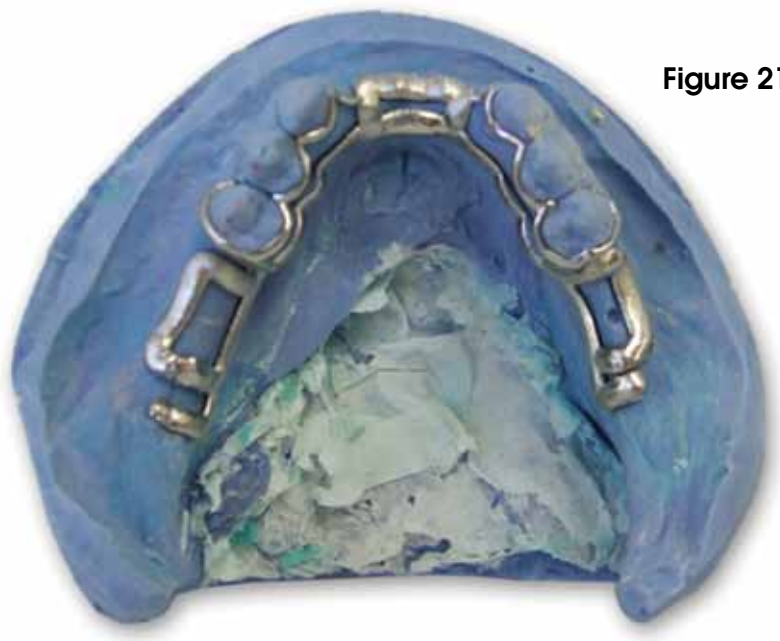




Figure 22

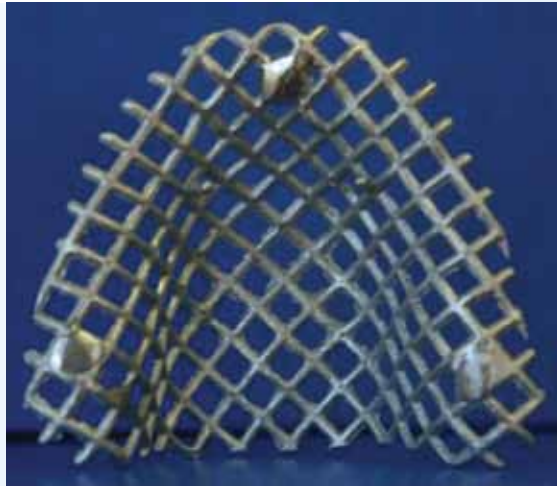


Figure 23

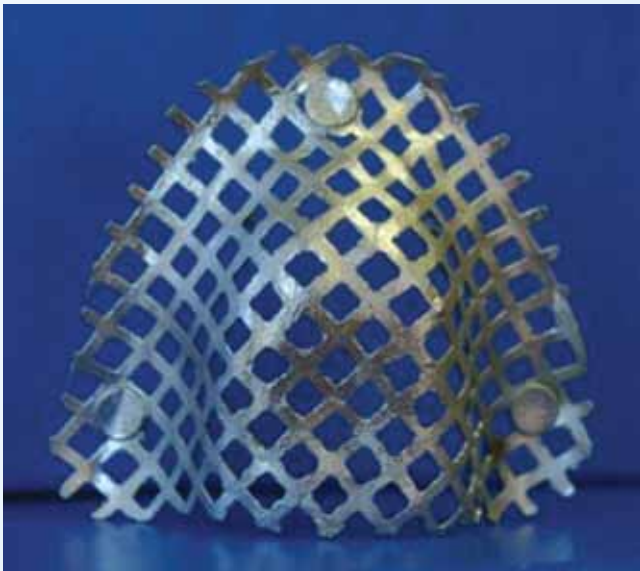


Figure 24

Also, we must emphasize that our technicians enjoy the fun factor of the system. Instead of using a wax spatula and Bunsen Burner, they can use video gaming skills in their daily work. For example, a 23-year old technician who has worked at our laboratory for four years said that using traditional methods seems like a job, but working with the digital system is like playing a video game all day long.

Finally, digital solutions have appeared on the market that support multiple types of dental restorations — not just crown and bridge - give the technician a familiar, easy-to-use interface and provide versatility. We believe these solutions ease the transition to digital and represent a tremendous improvement in productivity. Dental laboratories looking for ways to enhance their existing partial dentures business or add partial design as a new service, should take a fresh look at digital partial design as a source of new efficiency, differentiation, staff recruitment and revenue. **JDT**

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Udell is the co-owner of Udell Dental Laboratory, a family-operated, full-service dental laboratory located \ outside Minneapolis in St. Louis Park, Minn., that has been working with dentists since 1948.



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QUIZ:

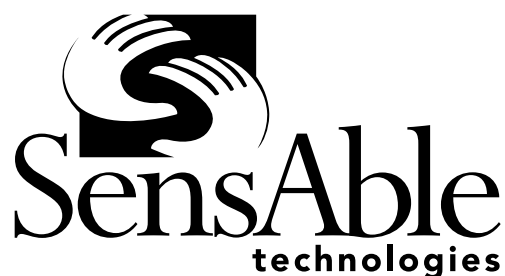
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