User Review

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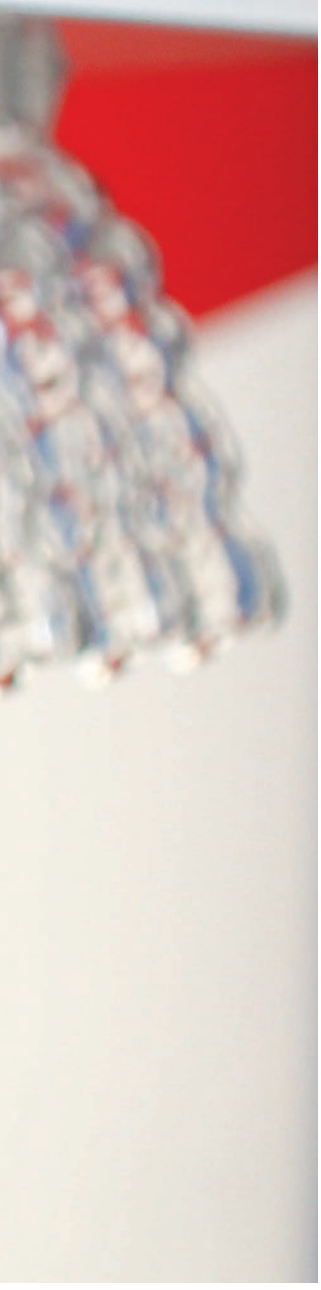


3D printing with Detax Freeprint resins

We recently integrated the Asiga PRO75 UV 3D printer into our lab, along with 3D printing resins from Detax.

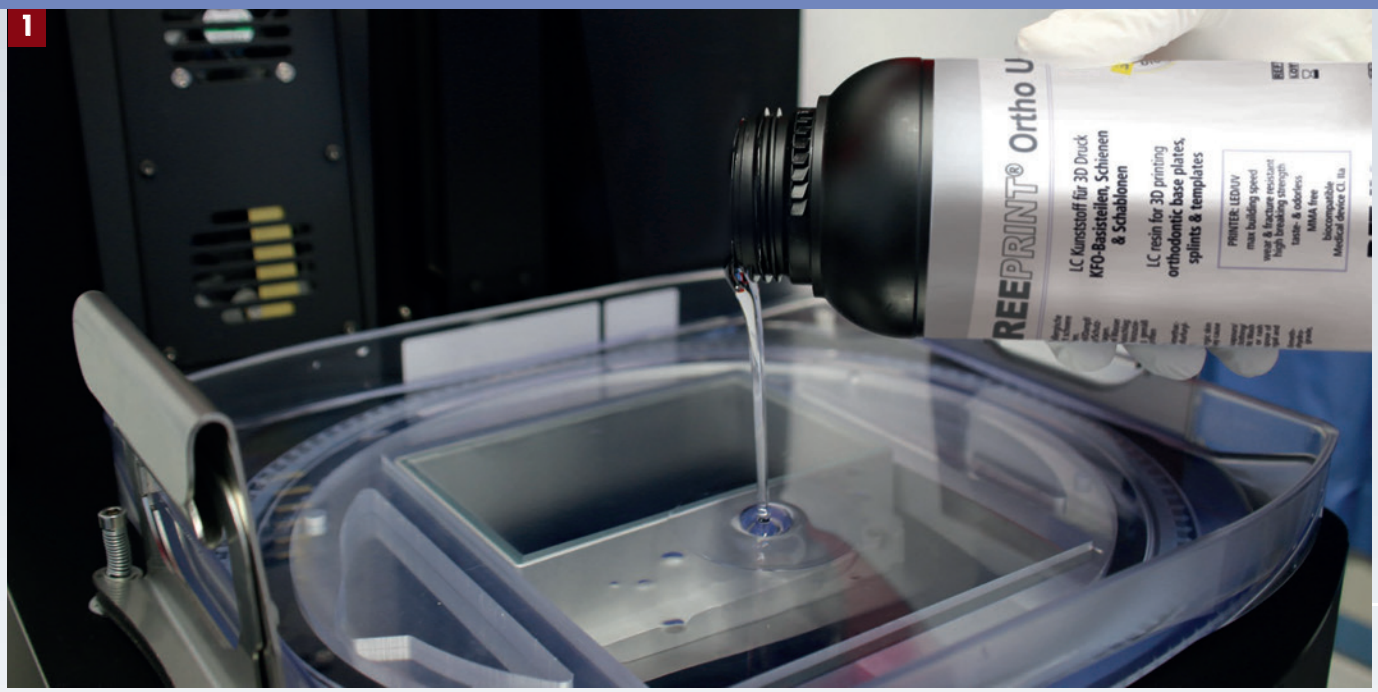
Our first question was how to integrate new procedures into our everyday routine. Would it help us to improve work flow by alleviating some of the work burden, or was it just generating more work?

At the IDS two years ago, 3D Printing really took off in the dental sector, with the launch of several 3D printers from well-known manufacturers. At that time we had to decide whether to invest in additive manufacturing technology or whether to watch and wait.

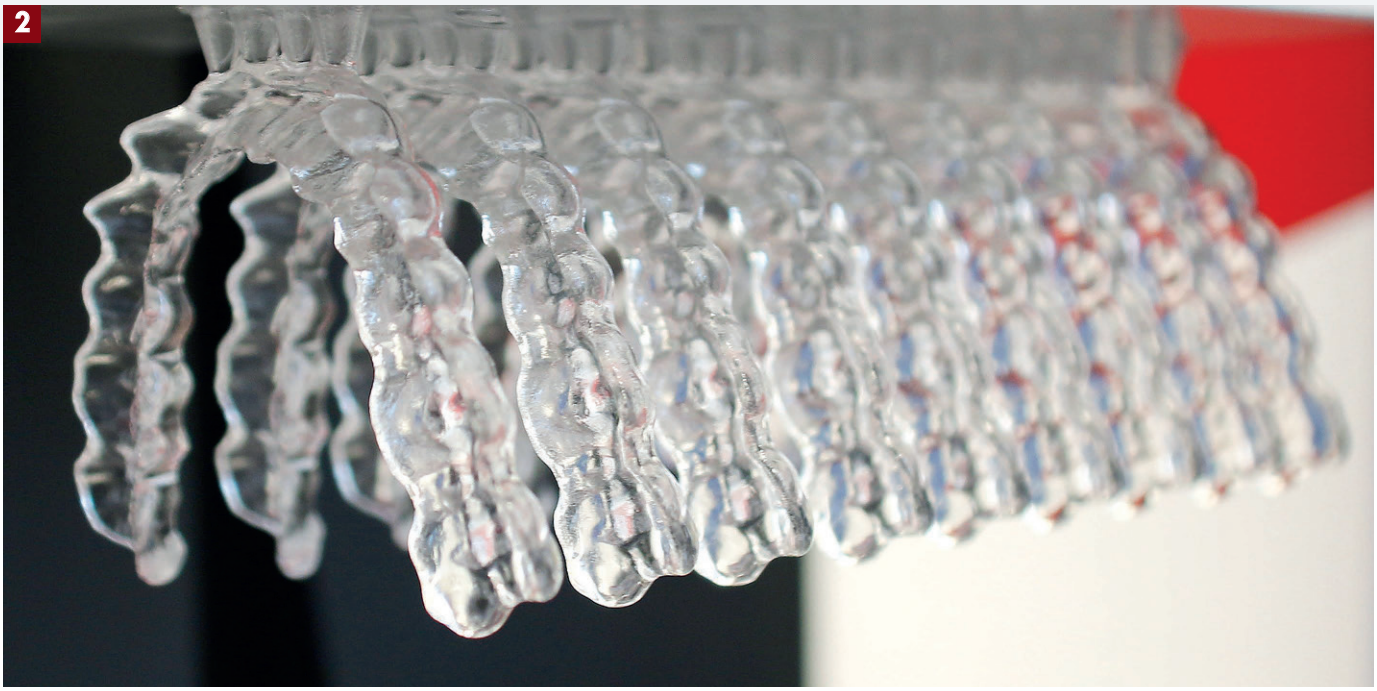
When it comes to balancing investment and success, a dental technician needs to ask themselves numerous questions on the results they can hope to obtain with the printer and print materials they have chosen:

- Are the material properties satisfactory when integrated into a daily work routine?
- Is the desired accuracy obtained?
- Do the printed cast templates warp?
- Is the splint material stable, yet elastic enough and still easy to polish?
- Are custom-trays torsion-resistant, do the tray handles hold?

We decided to take the leap and invest in this exciting technology. As part of the integration process into our lab routine, we tested various applications, such as splints, models and pattern and framework casting.



The liquid resin material is poured into the vat



Vertical positioning of splints allows for the printing of 12 splints in approximately three hours

Splints

We were given a brief introduction by the Detax product management technician and 3DXS (Asiga Sales Germany). Following this we decided to get going with our first project, which was splints.

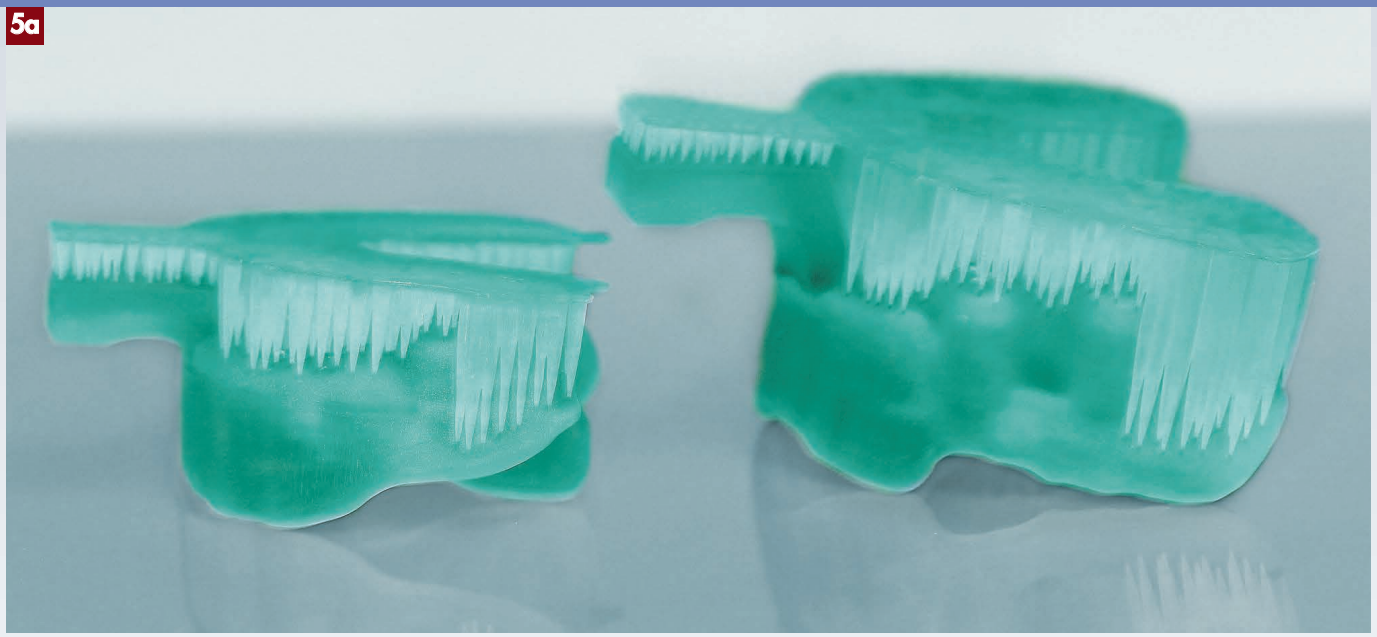
Splints are positioned vertically and take approximately three hours to print. Given the size of the build platform and the printer material vat (fig. 1), this layout allows for the positioning of around 12 splints per print cycle (fig. 2). Once the cycle is complete, non-polymerized resin is drained and any residual material adhering to the surface of the splints is removed by soaking in an ultrasonic isopropanol bath twice, for three minutes each time. We used the Otoflash G171 curing unit (NK Optik, fig. 3) for the final polymerization under protective gas (nitrogen).

Otoflash G171 – post-curing 2000 flashes

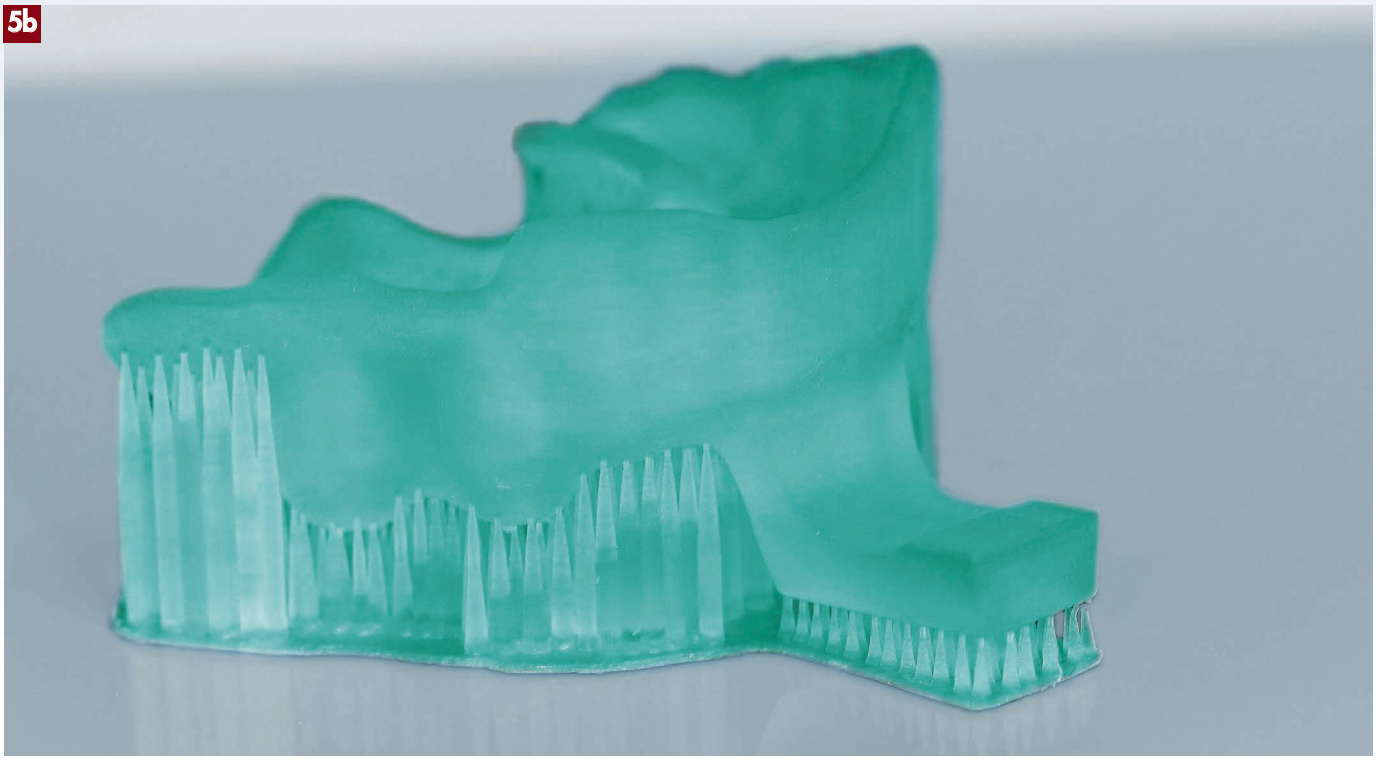
Printed splint (Freesplint ortho) on printed model (Freeprint model, ivory)

2 x 2000 flashes take roughly six minutes to complete post-curing. The next stage was to remove the support structure; this was fast and easy. Our first splints were finished, offering a convincing result with little effort. The material used, Freeprint Ortho UV (Detax), is a grade 2a biocompatible material (fig. 4) and was easy to process and polish after curing.

In the event that an adjustment or post-processing is required (such as incorporating a change in cuspid guidance) Detax also manufactures a transparent Modelling Composite material for hassle free modifications.



Individual trays, printed in Freeprint tray UV material

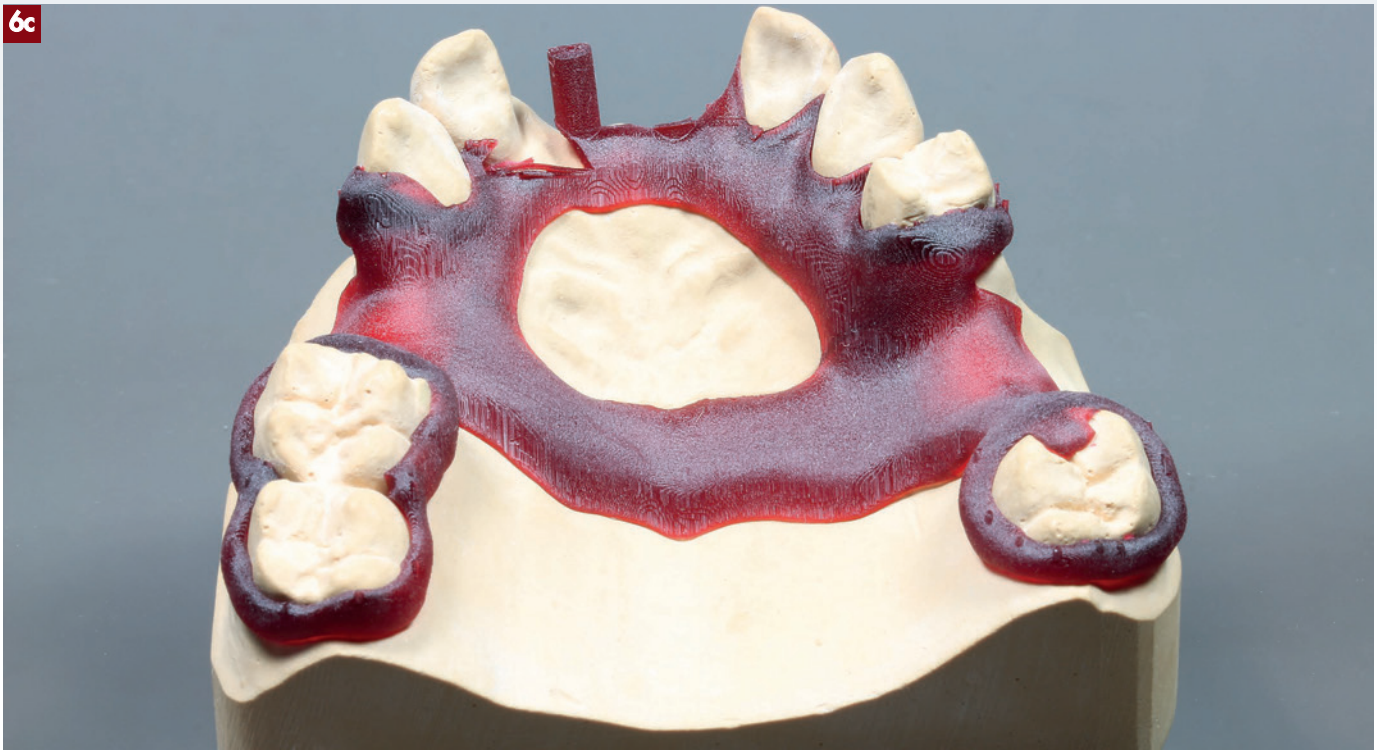


Custom trays

The next project we undertook was custom impression trays. We designed our trays using the 3shape software and scanner. The design process was completed in just a few steps: first the tray length was determined.
The software then blocked out undercuts automatically. An appropriate tray handle then needed to be chosen from the library and virtually positioned in the desired place. Once the design was complete we printed the STL file using the Asiga printer with Freeprint tray UV resin (Detax, fig. 5).

After a few tests, we found that the best stability when demoulding in the mouth was provided by following the manufacturer instructions and respecting a minimum thickness of 3 mm.
The printing time took between an hour-and-a-half to two hours when the tray was positioned horizontally, or a good four hours if positioned vertically. Once printed, the tray was transferred into an ultrasonic isopropanol bath and soaked twice, for three minutes each time, as for the splints. Post-curing was also done using the Otoflash G171 to obtain the final hardness of the tray

Printed partial pattern on plaster model



material. Once cured, the support structure was removed and the trays were finished. The dental practice with whom we were working gave positive feedback throughout, commenting, "Great aesthetics... as smooth as a custom-made industrial product."

Burnout frameworks

Our next project was to design a castable resin partial framework using the 3shape software, then to print it in Freeprint cast UV resin using the Asiga printer.

This material remains slightly elastic after curing and can easily be further processed on the work model (fig. 6). Once printed, the copings were cleaned in an isopropanol bath, then cured. By now we had integrated these stages into the lab routine.

Designing the base plate took little time, but placing the supports is more elaborate than for splints and trays. We had to place supports at every clasp and angle. It took a few attempts for us to get it right, but once we got the hang of it, it was fine. The result was very satisfactory, and the fit on the model was extremely good.

Models printed in Freeprint model material, ivory, sand and grey

Polymerization unit
Otoflash, post-curing with 2 x 2000 xenon flashes under nitrogen for 6 minutes.
Produced excellent surfaces for all case work.

Sterilization
Freeprint ortho is validated for sterilization in autoclaves according to EN ISO 17664.

Disinfection
Freeprint ortho components can be wet disinfected by immersion in MD 520 disinfectant (Dürr).

Equipment:
ASIGA Freeform PRO 75 UV
NK Optik Otoflash G 171

Detax materials:
Freeprint ortho UV Class 2a
Freeprint cast UV
Freeprint model UV (sand, ivory, grey)
Freeprint tray UV Class 1
Freeform Class 2a (gel/plast)
Easyform gel

We did not attempt vertical printing with partials frameworks. It took between an hour-and-a-half to two hours to print the frameworks horizontally. Once printed, any manual additions can be done using easyform LC, a modeling resin developed by Detax. Casting was straightforward and demonstrated clean burn-out, good cast surfaces and excellent fit.

Models

Model production would have been of interest to us. Unfortunately we currently don't work with dental surgeries that use intraoral scanners with an STL output format. This means that we have not yet tested model printing using the freeprint model UV material (fig. 7). However, we are convinced that dental practices will be able to provide us with STL files in the near future, allowing us to integrate model printing into our lab routine and offer faster production times.

Conclusion

We were very pleased with our first experiences of 3D printing. The printer and Detax materials were easy to use, offering excellent printing results with maximum precision and an accurate fit. The fabrication process is fast and requires little human intervention, freeing up technicians for other work. Uncomplicated handling through exchangeable material baths was an advantage. The resin is attractively priced and easy to store. Since there is no loss of material with this 3D print method, costs are kept down.
This is the type of dental progress which alleviates work in the lab! ◆

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