

How to benefit from 3D Printing

Crowned Dentist of the Year at this year's Dental Awards, Digital Ambassador for *The Probe* Dr Patrik Zachrisson shares his unique insight into the latest industry technologies – and what it all means for you.

Last month we discussed how more and more practitioners and therefore their patients are seeing the benefit from implementing digital technology in their dental practices.

Up to now many have sent their scans to the dental laboratory for processing and manufacturing. The dentists that are using a digital full chairside workflow like for instance Cerec, have seen the benefits with same day dentistry, with predictable treatments fully controlled by the dentist and very quick turn-around of the labwork. The trend for future developments are likely to be that we are all doing more digital treatment, and more technical work will be completed in the surgery.

A very exciting development in digital dentistry is the emergence of 3D printing technology.

3D printing allows the production of complicated structures that would be hard, or impossible, to create through CAD/CAM milling. The 3D design is done in dedicated software or sometimes directly in the chairside software used for designing prosthetics, models and appliances. The 3D object is then produced by a printing-machine capable of adding multiple thin layers of a material in a predictable and accurate way. 3D printers can now easily be added to the surgery workflow for a very reasonable cost.

There are now many types of 3D printers available, using different technology. One of the most commonly used in dentistry today is SLA, Stereo Lithography, where a scanning laser shines through a reservoir of light-sensitive resin and converts the liquid into a solid shape by curing it, spot, by spot. A platform in the reservoir then moves to allow the printing of the next layer, attached to the first. This procedure continues until the desired solid 3D shape has been created, layer by layer. This technology is used in many machines, for instance in the popular Form2 by FormLabs. A similar technology is used in Digital Light processing, DLP, where a UV image, rather than a laser, is used to cure the surface layer of a photosensitive resin. This technology can be seen in SprintRay printers. Both these technologies can be accurate, predictable and cost efficient. We are seeing new printers all the time, and new technology

is very quickly emerging. An exciting new development is the Continuous Liquid Interface Production, CLIP, seen in EnvisionTEC and Carbon printers. This allows resin to be cured continuously as a thin layer of oxygen is preventing the cured resin from sticking in the wrong places. This allows highly accurate prints at much faster speed, reducing the production time of for example a dental model from several hours using SLA to around 15 minutes with EnvisionTEC.

Printed models and appliances will need a little bit of post processing to remove uncured material and light curing to create a clean hard surface. We have to make sure the resin used is approved for the application and handled correctly to make sure it complies with regulations, if it needs to be biocompatible, and how long it would be used for.

We are seeing great choice of materials now available for dental applications, from resin for dental models and special trays, mock-ups for smile design, clear resin for surgical guides, PMMA for nightguards and splints, Valplast for flexible dentures and flexible resin for orthodontic attachment templates and many more. There are also many applications that

are more suitable for a lab setting, for instance the printing of castable resin for production of chrome cobalt frameworks.

A very exciting development we are seeing now is the release of resin for 3D printing dentures. This could revolutionize how we make dental prosthetics and drastically reduce the production time and number of appointment needed. Another developing field is orthodontics, where we can now quickly produce models for the in-house production of clear aligners, for a fraction of the cost of the major brands. We are close to be offering the production of clear aligners completely model-free for even quicker manufacturing.

At the end of the day, the patients are the big winners, as they are likely to be offered modern dentistry, planned digitally, more quickly, efficiently, predictably and with high quality.

The 3D printing technology is a paradigm shift that eliminates the complex processes in conventional manufacturing by reducing energy consumption and cost of production, respectively (Katreva et al., 2016; Lansard, 2018) ■



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Profile

Patrik Zachrisson is a partner of the Wensleydale Dental Practice, a nine surgery practice with in house Damas registered dental laboratory. He graduated as Dental Surgeon from the Karolinska Institute in Stockholm, Sweden in 1996. He has a special interest in digital dentistry, mainly for restorative and aesthetic dentistry and orthodontics.

He is a visiting assistant Professor of Digital Dentistry at College of Medicine and Dentistry, Birmingham.

Patrik is a founding partner of the Digital Dental Academy and has a keen interest in mentoring and teaching and regularly runs courses in digital dentistry, clear aligner orthodontics and smile design. He has been accredited a Platinum provider for Invisalign orthodontics. He is a Treasurer of the Local Dental Committee.

All I want for Christmas is...

As we gear up for the festive season, lots of people are feeling the strain. Expectations can come from every direction and there is a certain amount of pressure to have the perfect Christmas. Decorating the tree, preparing the dinner and choosing gifts can ramp up the pressure but the financial burden, having relatives to visit, and ensuring that everyone is happy can cause additional stress. Some people feel that they are in competition to arrange the perfect event, booking entertainment, thinking about what to wear weeks in advance, even trying to shed a few pounds. Ultimately, they want to make the 'right' impression.

It is human nature to compare ourselves with others and perhaps even judge our abilities on the approval of other people. Many individuals put themselves under pressure to appear, act in a certain way or conform in order to 'fit in'. Indeed,

most of us have an inherent desire to belong and gain acceptance, whether it is from family, friends, co-workers or even people that we don't know. Humans have a basic need to form personal connections and create harmony with others, so that they feel accepted and supported. Being part of a social network gives individuals meaningful roles which provide self-esteem. This in turn, gives them the confidence to voice their honest opinions, talk about their interests and feel more relaxed in social situations. In fact, research reveals that people that are socially connected are happier and healthier and tend to live longer than isolated individuals. Furthermore, having a wide support network to turn to for assistance, means that they are better able to cope with stressful events.

During the festive season attending social events and interacting with others can be a challenge for a surprising

number of people. They might feel shy or self-conscious around others, anxious about speaking to people they don't know or worried that they don't look as if they are enjoying themselves. All of which, can be compounded if they are unhappy with the way they look.

The condition of the teeth can have a considerable impact on both how a person feels about themselves and, the perceptions and assumptions that others draw. For example, if an individual feels embarrassed to speak, eat or smile in front of others because they have missing teeth, it can have a negative impact on their ability to socialise and communicate. As we know, first impressions can be made in milliseconds and people routinely make judgements based on facial appearances. We tend to stereotype people based on this, and people that are considered unattractive, may be perceived as less healthy, capable,

friendly or intelligent than those that are considered attractive. Furthermore, if a negative emotion is shown in the face such as sadness or anxiety, a negative impression is made – whereas a smiling face increases rates of attraction and is attributed to greater degrees of sincerity, sociability and competence.

Most people don't want to display unsightly gaps at the front of their mouth. However, a poorly fitting denture or one that moves, slides or becomes displaced, can be equally problematic. As well as the embarrassment of a denture that slips when smiling, speaking or eating, there may also be discomfort from sores, blisters or infections, accompanied by bad breath or an unpleasant taste in the mouth. Certainly, ill-fitting dentures can cause difficulties with speaking and eating, but they can also exacerbate social withdrawal, isolation, and low self-esteem... **Continued on page 24**