By Erwin Eitler, Switzerland

Restorative treatment of the edentulous jaw requires, above all, sound knowledge of the function and statics of dental prosthetics. Customised pink-and-white aesthetics that match the expectation of the patient represent the ‘cherry on top’ here, adding extra quality to the treatment.

We all know it, but let’s say it again: The number of edentulous patients will increase sharply over the coming years due to ongoing changes in demographics. The older people grow, the larger the number of edentulous patients will become. Complete prosthetics will therefore remain of high relevance for both clinicians and technicians and should not be neglected neither in the education and training nor in the day-to-day work of dental professionals. Sound knowledge coupled with clinical and technical expertise are essential to achieve satisfactory results. Upright, complete dentures for edentulous patients appear to hold little promise from an economic point of view. However, the writer of this report maintains that this is a question of perspective. Complete denture prosthetics is a supreme discipline that allows a customised approach for each individual patient. An appropriate treatment strategy can be selected from a range of processing techniques to meet the individual needs of the patient being treated. Accordingly, outcomes range from e.g. highly aesthetic, custom-made tooth replacements to ‘basic’ complete dentures manufactured using a digital method. Whichever method is used, function and stability will always be at a high level. Any compromises in statics and function would not be acceptable.

Preoperative situation

The 73-year-old female patient presented with severe periodontal damage in the upper and lower jaw (Figs 1 and 2). The oral cavity was free of inflammation and looked well maintained. However, the periodontium had been irreversibly damaged by periodontal disease. The clinical diagnosis showed that the teeth in the upper jaw could no longer be preserved. Some of the lower teeth also had to be removed. However, the lower premolars and canines were still in a good enough condition to be used as anchors for a dental prosthesis. A conversation was held with the patient to discuss her expectations and treatment options. She wanted to have dentures that could give her stability. Most important of all, she wanted to be able to chew normally again. She also described her difficulties in speaking and expressed her discomfort about her appearance. She wished to have a ‘beautiful’ smile again and be able to speak without impediment. In addition, the dentures should be easy to clean and handle and they should be hard-wearing. Implant-based treatment measures were not an option, as she wanted to avoid any additional surgical intervention. It was therefore decided to restore the upper jaw with a complete denture and the lower jaw with a partial model cast denture.

Treatment planning

Casting a tooth replacement for a family member is always a special task for a dental technician, especially if, as in this case, said family member was the technician’s own grandpa. This increases the challenge of a task that is already demanding (complete dentures). The goal was to create dentures that harmonize with the face of the patient in a naturally beautiful and discreet way. Function and yet highly aesthetic dentures should be achieved.

Primary requirements of the patient on the dentures:

- Reduced chewing function
- Improved phonetics
- Discrete integration of the dentures
- Individualized aesthetics
- Easy to clean

Anterior teeth and setup in the oral cavity

First, the teeth in the upper and lower jaw that could no longer be preserved were extracted and the extraction wounds were allowed to heal. After that, impressions of the oral situation were taken. The diagnostic casts were used to establish the arrangement of the upper anterior teeth. For this task, high-quality prefabricated denture teeth (SR Vivodent® S PE) were used. These moulds provide impressive individualized aesthetics for the anterior region. The expressive texture and internal stratification of the teeth lend an age-appropriate natural likeness to the dentures. In addition, the teeth are made of a material that meets the requirements for durability, consisting of highly cross-linked DCL (Double Cross Linked) polymer. According to the manufacturer, the DCL polymer is a modified poly(methyl methacrylate) variant that offers higher compressive strength and better durability than conventional PMMA – while the material’s flexibility is similar as that of conventional resins.

After the casts had been analysed, the teeth were set up according to the known parameters. Despite clearly defined aesthetic guidelines, it is crucial to check the setup on the patient and to adjust it as needed. The anterior setup was adjusted in the mouth of the patient to match the setup established in the oral cavity. Posterior setup was then performed accordingly. The teeth were set up in a one-tooth-to-two-teeth relation taking all the principles of complete denture prosthetics into account. The SR Orthotyp® S PE posterior moulds are also made from DCL polymer. The beautifully shaped tooth necks of the anterior and posterior moulds, modelled on nature, merit particular mentioning here. They facilitate the aesthetic conversion into composite because the shape imitates the appearance of solid teeth growing from the “gums”. A try-in of the setup in the oral cavity helped to verify the arrangement of the anterior teeth established in wax stage by stage.

Completing the dentures

A model cast framework was produced for the lower jaw. The den-
tures are locked into place in the mouth with the help of six clasps. If the patient should lose another tooth, the denture can be easily extended. Special care was taken to ensure that the model cast framework featured an open periodontal design to facilitate self-cleansing.

The SR Ivoclar® system was used for transferring the maxillary wax-up into resin – a system that couples efficiency with reliability. The injection procedure offsets the chemical shrinkage of the resin during polymerization. High-strength PMMA-based Ivoclar was used for the manufacture of the denture base. The wax-up dentures were invested and the sprues attached. After the moulds had been cast and the invested and the sprues attached, the waxed-up dentures were transferred to the dental technician (who, just to remind you, is the grandson of the patient). Step by step, the complete upper denture was given a natural look with the help of the light-curing lab composites. Final polymerization was followed by mechanical polishing (Figs 7 and 8). The model cast denture for the lower jaw was also completed (Figs 9 and 10).

The result
The patient was impressed with her new upper and lower dentures right away. Once inserted, their natural and highly aesthetic effect became even more apparent (Figs 11 and 12). This effect can be attributed, among other things, to the macro- and micro-texture of the anterior teeth and the vibrant interplay of shades between the teeth and gingiva. The harmonious interaction between the white and pink aesthetics is impressive. With the dentures in situ, the functional, aesthetic and phonetic parameters were again verified (Figs 13 and 14). The preliminary work was worth it. The dentures met all the requirements. The patient was happy and relieved that her grandson had mastered the double challenge so well.

In her own words, she discovered a whole new zest for life (Figs 15 and 16). Her tooth replacements offer her much more positive about life. She is now interested in meeting up with friends again and become involved in the social life around her.

Summary
Processing technologies that enable restorative treatments customised to the needs of the individual patient are increasingly becoming established in complete denture prosthetics. For instance, digital methods allow the fabrication of solid “basic” dentures using relatively little effort. Alternatively, these basic applications can be supplemented with high-quality materials combined with – as cherry on top – a manual layering technique (gingiva) to create highly aesthetic results. Irrespective of economic aspects, the basic functional and static parameters always remain the same. Every complete denture ought to restore full functionality, sound knowledge and experience in complete denture prosthetics provide the basis for achieving this.

Erwin Eitler, Dental Technician
Zahnarztszufahrte Zimmermann und Maeder AG
Hirschengraben 2
3011 Bern, Switzerland
www.zmdental.ch

For further information, please contact:
Ivoclar Vivadent AG
Brombeere 2
FL 3344 Schaan
Web: www.ivoclarvivadent.com
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Driving innovation forward

By Dentsply Sirona

As the Director of Research and Development for Dentsply Sirona Lab, Markus plays a central role in terms of our innovation pipeline. He is the person who drives new product developments, for example, innovative materials such as Celtra® Press.

Thanks to his expertise, great communication skills and inventive thinking, Markus understands our customers’ needs and turns them into new and smart product ideas. His work philosophy reflects Dentsply Sirona’s unique positioning by always laying out the whole picture of the workflow. He is working closely together with other Dentsply Sirona business units to generate valuable links to related workflows. This means that you can benefit from thought-out end-to-end solutions, and subsequently benefit from tangible improvements in your daily work.

In this interview, Markus explains the various facets of his work as well as the secret behind real innovation.

Tell us a little about your role as Director of Research and Development? What are some of your current endeavors and/or challenges?

A typical day for me is full of reviewing the statuses of all running product development projects, prioritizing and identifying what obstacles or surprises (sometimes positive, sometimes negative) there are or might be, and how we can manage all of these things in order to either meet existing timelines and deadlines or to be able to start new projects which are fitting in the overall portfolio of the company.

For the development team, one needs an open ear to absorb every single surrounding detail, which includes being completely receptive and having a comprehensive, up-to-date understanding of our production, quality assurance, product management, and even logistic teams. In R&D, you need constant curiosity, great communication skills and inventive thinking.

How does science, clinical studies, and research fit under the Dentsply Sirona Lab name? Can you provide a little background on what you do when you start testing a product before it actually goes into development, and ultimately goes to market?

Due to the fact we are working in the medical devices market, we fulfill a great number of demands for testing and design control processes. For example, when developing a new material, we need to look at the biocompatibility as well as risk management starting from the production process, to the user, all the way to the end result — our patients. Besides proving and surpassing all requirements from applicable standards, we also want to know how our customers accept the workflow of the product. Before we launch, we take a close look at how it fits into the actual workflow of real-life dental laboratories, and we then start additional vigorous clinical testing after the launch as well. We include our customers quite early on in this process to allow us to react to their outcomes and feedback, and then be able to improve the product within the development timeline.

What makes Dentsply Sirona unique is that the entire workflow is available, and it can be linked to other workflows and combined into an integrated solution.

When it comes to the prosthetic treatment of an implant using an abutment and full ceramic crown, for example, Dentsply Sirona Lab is the right partner for laboratories. But the treatment workflow as a whole starts from the earlier stage of diagnostics and the implantological treatment, and ends with the restoration finally being cemented or screwed in place. For this purpose, Dentsply Sirona and its Imaging, Implants, and Restorative business create integrated workflows for both dentists and dental laboratories.

One of your roles within Dentsply Sirona is to constantly provide material innovations that expand lab offerings to their dental clients, while improving their workflow. How do you gather the information needed to improve upon these offerings?

We use groups of our core customers, labs and dentists. Sometimes the most effective feedback comes from our labs and dentists who are everyday partners because they know their ideal workflow routine, and are able to communicate their emerging concerns and ongoing daily challenges.

Can you tell us a little about Celtra® Press, the newest material for laboratories? What was the industry missing (doctor, labs, and patients) that this material now offers? Celtra® Press has significantly improved the workflow in the lab by being easier to press (with excellent flowability) and excluding the time-consuming and dangerous use of hydrofluoric acid to get rid of the mastication layer. Despite that, it is other than possibly high-strength glass-ceramic materials on the market. Therefore, Celtra® Press provides a simpler workflow in the lab, the dentist receives a robust material with a very good fit and easy polishing ability, and the patient absolutely loves the naturally looking aesthetics and beauty of his or her new teeth.

What do you foresee Dentsply Sirona offering in the near or distant future as far as material advancements?

We will soon present a new generation of CALCIUM Material, in hand with the lab material combinatory Celtra®. Celtra® provides what is suitable for every case. We are also planning further material improvements to other material sectors coming very soon!

By Brendan Day, DTI

Powered by 3D Systems’ proprietary Figure 4 technology, the NextDent 5000 is a high-speed 3-D printer designed to save time for dental labs. Degersheim suggests that the printer is especially well suited to labs that have similar time pressure issues to dental practices, or who need to produce things fast, in multiple colours and often in large quantities. To be frank, these are all easily achievable with this printer.

Often, a dentist will send some scans to us so that we can quickly create a smile design for the dentist to print a mock-up in of his or her office. Though we are based in the Netherlands and have clinicians working with us from Germany, the NextDent 5000 allows for this entire procedure to be conducted in less than 2 hours.

What has the feedback been since the launch of this printer? What have customers most liked about it?

Celtra® was important for us, because as these gentlemen have already mentioned, was that the printer has a high level of accuracy. With ten years of experience in the 3-D dental printing industry, I’ve learnt that a lot of printers work fine in the beginning but lose their accuracy over time. When 3D Systems acquired our company, we decided to make sure that our printer would work without issue, day in and day out, for at least three years. Flexibility, speed, accuracy and ultimately, affordability of the machine and the materials—these, along with training and ongoing support from our outstanding resellers, are the foundations of the NextDent 5000.

We got a lot of feedback from users of this printer, like Michael and Sebastiaan, and thankfully, our R & D team in San Diego really listened to what they asked for, what the market asked for. I think this is what our company should always do: listen carefully to our customers and design according to what they need.

Are software updates included?

Jacob: Absolutely. As long as the user is connected to the Internet, he or she will always have the latest updates automatically downloaded to the printer.

It’s predicted that, within three to five years, more than 50 per cent of dental labs globally will have an in-house 3-D printer. What, in your opinion, is driving this growth?

Jacob: Well in 2018, we definitely passed a tipping point for 3-D print- ers here at 3D Systems. Thanks to easier registration, certification, improved ease of use, and a range of other factors, it has become much more achievable to integrate a 3-D printer into one’s daily workflow.

Scherrer: Clinicians are now expecting dental labs to be digital and to have printing capabilities. It’s no longer a case of whether a lab will take your files, but rather if they print themselves or still outsource it. That’s how fast 3-D printing has grown in dentistry.

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For more information about Dentsply Sirona lab portfolio please contact your local representative

Dentsply Sirona

2205 E. Gate Tower Business Bay, Al Saada Street
Dubai, United Arab Emirates
Tel. +971 (0)4 523 0600
Web: www.dentsplysirona.com/en
E-mail: MEA-Marketing@dentsplysirona.com

Interview: “We definitely passed a tipping point for 3-D printers”