Better sugar labelling required

By DTI

NEWTOWN, Australia: In a new study carried out by researchers at the George Institute for Global Health, it was found that a significant amount of sugar is added to foods. Owing to a decline in the overall health of Australians, dentists have called on food manufacturers to state on their packaging the amount of sugar added to the products, according to the Australian Dental Association.

The Health Star Rating front-of-pack labelling system used in Australia rates the overall nutritional profile of packaged foods and includes total sugar content as one of the components. This has been criticised because sugars naturally present in some foods are treated the same as sugars added during processing. However, according to co-author of the study Prof. Bruce Neal, only labelling total sugar content is misleading. This is particularly true for discretionary products containing a great deal of added sugar. “Good sugars are an integral part of a healthy diet, and we need to be able to separate sugars naturally present in dairy, fruits and vegetables from sugars added during manufacturing,” he said.

The aim of the study was to show that greater transparency on added sugar in packaged foods is necessary. The researchers analysed more than 34,000 packaged foods—about 38,000 discretionary foods (those not necessary to provide the nutrients the body needs) and nearly 16,000 core foods, like milk, cheese and bread—to learn how the labelling could be improved if added sugars were included. A report published earlier this year found that consumers could avoid 26 teaspoons of sugar a day if they could identify added sugars on food packs.

The study, titled “Incorporating added sugar improves the performance of the Health Star Rating front-of-pack labelling system in Australia,” was published on 5 July in the *Nutrients* journal.

Erosive potential

The low cost and availability of acidic fruit juices, fruit drinks and carbonated beverages encourage their consumption, and this may lead to elevated prevalence of dental erosion. Researchers at the Federal University of Santa Catarina in Brazil recently evaluated the chemical characteristics of grape and orange juice and their erosive potential in the decrease of microhardness and the loss of enamel structure.

The results showed that grape juices presented greater erosive potential than orange juices. Pure, powdered and concentrated grape juices showed similar loss of enamel structure to that of a cola soft drink. The erosive potential of the beverages was statistically correlated to pH, titratable acidity, and calcium, phosphate and fluoride concentrations.

Humans’ arrival in Asia

According to recent fossil teeth findings, the human dispersal out of Africa and down to Australia may have occurred 40,000 years earlier than previously thought. Using a new dating program, it was confirmed that the teeth came from modern humans, Homo sapiens, and most interestingly that they dated to as long as 75,000 years ago.

World’s longest tooth

An 18-year-old teenager from India holds the new Guinness World Record for the longest human tooth. With a length of 3.96 cm, the tooth beats the previous world record by almost 5 mm, the records committee confirmed. The canine was buccally located and surgically extracted for aesthetic reasons.

Drop in denture use

MELBOURNE, Australia: From new figures indicating a decline in denture use in Victoria, it appears that more older people are retaining their natural dentition. The data, which was released by the Dental Health Services Victoria (DHSV), relates to the number of dentures provided by Victorian public dental clinics to patients aged 65 and older. Overall, there was a 2.9 per cent drop in denture use over the eight-year period considered. “Older people are keeping their teeth longer and we hope this trend will continue,” DHSV CEO Dr Deborah Cole said.

In an interview with Dental Tribune, Cole explained the underlying reasons for this. “The current cohort of older adults has benefitted from substantial improvements made after the post-war boom. These improvements include community water fluoridation and use of fluoride toothpaste, advancement in dental technology and treatment methods, access to healthier diets, improved oral hygiene and more regular dental check-ups.”
New NUS 3-D printing centre to focus on healthcare applications

By DTI

SYDNEY, Australia: The Australian Dental Industry Association (ADIA) has been awarded the first Association of the Year Award by Associations Forum, a body that annually awards the Association of the Year Award to the association that best exemplifies the values of providing a positive contribution to the Australian business environment.

The award recognises ADIA’s ability to influence government decision-making, deliver world-class exhibitions and publish meaningful market intelligence. In addition, Associations Forums highlighted that the dental body delivers its services at a cost to members lower than would otherwise be the case.

“Being named Association of the Year is a great tribute to the many individuals who, over many years, have worked to ensure that ADIA is an integral partner to the industry it represents,” ADIA National President Phil Jolly said in his acceptance speech. “ADIA’s commitment is to provide leadership, strategy, advocacy and support. Our members set our agenda, fund our activities and directly benefit from the results—this award is a great independent recognition of our success in this area,” he added.

The Association of the Year Award was presented at a gala dinner held in Sydney on 17 July. More than 300 stakeholders from across the not-for-profit sector attended the event.

By DTI

SINGAPORE: The National University of Singapore (NUS) has formally opened its new US$18 million Centre for Additive Manufacturing (AM) among NUS’ clinician to stimulate association manufacturing (AM) among NUS’ clinician to stimulate...
SYDNEY, Australia: Research conducted by the University of Sydney has found chewing and biting to be the cause of adult teeth breaking through the gums rather than an innate, unknown force. The researchers used CT scan images of an eight-year-old child’s mandible to design a 3-D model that could be used to observe the forces produced by the jaw when biting and chewing. The aim of the research was to show the stress dispersion within the jaw as a person bites and chews.

“We designed the hard and soft tissues in the jaw and input the data we had about jaw movements into the software,” said Dr Babak Sarrafpour, an oral and maxillofacial pathologist and dentist at the University of Sydney. “We simulated both the back teeth and front teeth chewing and we could assess the stress on the teeth, bone and soft tissue.”

The multidisciplinary team at the university found that the chewing and biting actions of the jaw deform the thin layer of soft tissue surrounding the teeth that are yet to appear, which forces them outwards. During the study, a number of other hypotheses were investigated that were still unsupported by clinical evidence. “There were a number of hypotheses surrounding how adult teeth erupted. Perhaps it was from the root forming and pushing the tooth towards the oral cavity, maybe it was the blood pressure in the dental pulp or perhaps it was the periodontal ligaments forming and contracting, pushing against the tooth,” said Sarrafpour.

However, a number of studies have shown that even with the disconnection of the root and the ligaments from the tooth, the eruption through the bone would still happen. Therefore, the researchers developed another theory. “Perhaps soft tissue dental follicle around unerupted adult teeth acts as a mechanosensor in response to biting forces and remodels the surrounding bone in a way that carries the tooth to the mouth,” Sarrafpour explained.

The team believes that this study could result in further preventive treatments that could change the tooth angle before it erupts, rather than depending on orthodontic bands or braces to realign the tooth later in life.

More information about the research project can be found at the university’s website.
Mobile breath analysis device promising for early disease diagnosis

By DTI

SEUL, South Korea: Breath pattern recognition was once thought of as a futuristic diagnostic platform. Research in this area has been gaining much attention because breath analysis is a non-invasive and low-cost method. Among the most critical challenges in this regard is the development of sufficiently sensitive sensors. Korean scientists have now developed high-sensitivity sensors to enable early monitoring of various diseases based on biomarker gases in breath.

The research group, led by Dr Il-Doo Kim in the Department of Science and Engineering at the Korea Advanced Institute of Science and Technology, has developed highly sensitive and selective chemiresistive sensors that can potentially diagnose specific diseases by analysing exhaled breath gases. The sensors were developed by combining hollow protein-templated nanocatalysts with electrospun metal oxide nanostructures, which have large and highly porous surface areas and thus achieve high sensitivity.

Human breath consists of diverse components, including water vapour, hydrogen, acetone, toluene, ammonia, hydrogen sulphide and carbon monoxide, with greater or lesser amounts exhaled in the case of illness. Some of these are closely associated with diseases such as asthma, lung cancer, Type 1 diabetes mellitus, and halitosis.

Breath analysis can detect trace changes in exhaled breath components, contributing to early diagnosis of disease. Breath analysis starts with capturing exhaled breath in a Tedlar bag and subsequently injecting the captured breath gasses into a miniaturised sensor system, similar to an alcohol detector. It is possible to analyse exhaled breath very rapidly with a simple analysis process. Breath analysis can detect trace changes in exhaled breath components, contributing to early diagnosis of disease. However, gases in the breath occur at very low levels, from 1 ppb to 1 ppm, and so extremely sensitive sensors are needed for accuracy. In particular, it has been a challenge for chemiresistive chemical sensors to detect specific biomarkers.

Conventionally, platinum and palladium are used in developing catalysts; however, the sensitivity is insufficient. The sensors in the current study were specially optimised for selective detection of specific biomarkers. Their performance was approximately three to four times better than that of platinum and palladium catalyst-loaded nanofibre sensors. In particular, their sensitivity to acetone and hydrogen sulphide was the highest reported in literature.

New types of heterogeneous nanocatalysts were synthesised using protein templates with sizes around 2 nm and functionalised on various metal oxide nanofibre sensing layers. The established sensing libraries can detect biomarker species with high sensitivity and selectivity. The new and innovative breath gas analysis platform will be very helpful for reducing medical expenditures and continuous monitoring of physical conditions, said Kim.

The study, titled “Innovative nanosensor for disease diagnosis”, was published in the July issue of the Accounts of Chemical Research journal.

Study evaluates digital scanners

By DTI

CHARLESTON, USA: With intraoral scanning becoming increasingly prevalent in dentistry, knowing which scanner will give the best performance is essential. In a new study led by Dr Walter Renne, from the Department of Oral Rehabilitation at the Medical University of South Carolina, researchers looked at seven scanners and analysed their performance based on 3-D comparisons. They found that Planmeca PlanScan and 3Shape’s TRIOS performed the best.

The study’s main objective was to compare the trueness and precision of the scanners in both posterior sextant and complete-arch scenarios. Additionally, it looked at the time each scan required and correlated it with trueness and precision.

To achieve the most accurate and no-bias results, a custom complete-arch model was fabricated with a refractive index similar to that of tooth structure. Six digital intraoral scanners and one digital laboratory scanner were used to scan the custom model for both scenarios. Analysis was performed using 3-D metrology software to measure discrepancies between the master model and experimental casts.

According to the study, Planmeca PlanScan was found to have the best trueness and precision for sextant scanning, and 3Shape’s TRIOS the best balance of speed and accuracy for complete-arch scanning.

The study, titled “Evaluation of the accuracy of 7 digital scanners: An in vitro analysis based on 3-dimensional comparisons,” was published in the July issue of the Journal of Prosthetic Dentistry.

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“We are seeking business opportunities worldwide”

An interview with Kenji Cheung, CEO of Hong Kong-based supplier Tesco Dental

By Kristin Hübner, DTI

Established in 1974, Tesco Dental is a leading Asian dental supplier. The family-owned company is based in Hong Kong, with subsidiaries in Shenzhen, Shanghai, Taiwan and Beijing. Dental Tribune spoke with Tesco CEO Kenji Cheung about the company’s values and its vision of leading modern dentistry into the future.

Could you introduce Tesco briefly for our readers?

The Tesco Dental group offers a one-stop solution for the dental industry. Our portfolio includes dental education, different types of advanced dental products and equipment for dental practices and laboratories, including aftersales training and consultant services.

Our professionals are dedicated to providing training in advanced dental technology to lead modern dentistry into the future. Tesco Dental offers quality services and technical support and brings bright smiles to our customers through our genuine aesthetic concept. We listen carefully to our customers and treat them with consideration and respect.

Which regional markets are you targeting specifically?

Tesco Dental is a leading dental supplier with subsidiaries in our main markets of Hong Kong, China and Taiwan.

What are your values as a family-owned business?

Trust in the family allows us to share our opinions openly and freely. It enhances our company’s efficiency, since decisions do not need to pass through a complicated hierarchy. It really took a while for us to understand our strengths and beliefs. Over the past few years, we have summarised the core values of our company: integrity, creativity and passion. How would you describe your position in the market? I would say we are a pioneer and a market leader in terms of offering complete dental solutions. In the very beginning, my father, Cheung Tak, who founded the company, together with VITA Zahnfabrik was among the few introducing metal-ceramic restorations to China in the early 90s. Today, we focus on both analogue and digital restorations, as well as infection control, endodontics and oral healthcare.

Have you observed any trends that you feel Tesco ought to follow?

Artificial intelligence must be the leading trend regarding future developments and an increasing digitalisation. We have adopted the latest payment technologies, now offering users the convenience of Alipay and UnionPay and credit payments using Visa or Mastercard. Regarding our social media activities, we have a WeChat fan page that provides dental information, news and updates and that links dental professionals. Currently, we have over 176,000 followers; this number represents about 70 per cent of all dentists in China. Moreover, the Asian market has been growing rapidly, resulting in huge demand in the dental industry. This is mainly due to a general increase in income and people seeking a better quality of life. Consider Taiwan, for example. It is a market with increased emphasis on and concern regarding infection control and oral health care, so we provide a variety of related products to meet the country’s shifting needs.

Do you plan to make inroads into other fields or regions? We plan to expand geographically, but focus only on dentistry-related industries, as it is our main expertise—especially for emerging markets such as the Philippines, which we believe represents great growth potential for us.

You are actively promoting the advancement of dentistry in China. Could you describe your engagement in this area?

Yes, we have continued to introduce advanced dental technology in China. As an organiser of training events, we have also put tremendous effort and resources into the education of dental students and we offer many workshops and courses for continuing professional development of dentists and dental technicians in China.

Regarding charitable initiatives, we recently introduced our For You, For Him/Her, For China campaign, through which we provide free materials to laboratories and dentists to help those in need of dental treatments who cannot afford it. With which institutions or research bodies are you working? We are working closely with almost all reputable universities and hospitals in Hong Kong, China and Taiwan.

What are your strategic plans for the future? We are seeking business opportunities worldwide. In recent years, we have acquired several quality dental enterprises, manufacturers and research projects. Our goal is to become a comprehensive dental solutions provider all over the world.

Thank you very much for the interview.
DTI welcomes new partner from Japan

By DTI

LEIPZIG, Germany: Dental Tribune International (DTI) has added a new licence partner to its global publishing network. Together with Tokyo-based company Medical Net, the DTI publishing group will now also be providing dental professionals with the latest news in Japanese. The first issue of the new edition is set to be published in October.

In Medical Net, DTI has found a strong local partner in the country. The listed Japanese company is engaged in portal site management and runs a variety of medical and dental search sites.

“We are pleased to have finally joined DTI,” commented Medical Net President and Chief Operating Officer Yuji Hirakawa on the new partnership. “Japan is the third-largest economic power in the world and there are many good dental companies in the country. We want to be a bridge between Japan and the rest of the world.”

The alliance is part of the company’s efforts to expand its business outside of Japan. According to Hirakawa, who established Medical Net in 2001, the company had previously focused on its home market exclusively. Another step towards internationalising business will be the opening of a dental clinic in Bangkok in Thailand in September, he said.

Launching in autumn, Dental Tribune Japan aims to reach about 20,000 dentists and 10,000 dental hygienists through its local website. The first issue of the print edition will be published on 2 October with a print run of approximately 20,000 copies. As of 2018, the targeted publication frequency will be four editions a year with a print run of 30,000 copies.

With more than 100,000 dentists and about 64,000 dental clinics, the Japanese dental health care sector is one of the largest worldwide. Figures from Statista on the number of dentists between 2000 and 2014 show that the profession enjoys great popularity and has continued to grow. The number of dental practitioners per 100,000 inhabitants rose from 70.3 in 2000 to 80.7 in 2014.

Catering to the needs of the growing number of dental professionals, Medical Net also plans to add an educational offering to its portfolio in the future, utilising DTI’s expertise as an organiser of continuing education programmes, including e-learning, through the Dental Tribune Study Club.

The combined DTI portfolio currently includes more than 150 print publications and multiple websites that reach over 650,000 dentists in more than 90 countries and 25 languages.

Sulzer enforces its rights against South Korean counterfeit products

By DTI

WINTERTHUR, Switzerland: Swiss-based dental manufacturer Sulzer Mixpac has successfully filed legal actions against three South Korean suppliers and a manufacturer of copies of the company’s patented MIXPAC tips. According to Sulzer, it is not the first time that counterfeiters of its static mixing tips for two-component cartridges and syringes have been discovered.

Shortly before the 2017 International Dental Show (IDS), the three Korean infringers accepted the preliminary injunctions filed at the Düsseldorf regional court. Furthermore, the manufacturer of the patent-infringing mixing tips, Seil Global, has agreed to respect Sulzer’s rights worldwide for all members of the patent family for their remaining lifetimes, the company stated.

In addition, 11 preliminary injunctions for unfair competition were issued by the court against various providers during IDS 2017 in which the offering, advertising and marketing of these counterfeit mixing tips for the dental industry were prohibited.

Although Sulzer has enforced its rights in dozens of cases already, copies of its mixing tips and patent-infringing mixing tips have increasingly been discovered in recent years, the company said. Counterfeit products from other manufacturers are not subject to Sulzer’s strict quality controls and not covered by its warranty. In addition to violating intellectual property rights, unauthorised products can lead to incomplete mixing and failed procedures, as they are manufactured under unspecified conditions with unknown plastics and colours, the company warned.

According to Sulzer, counterfeit mixing tips look very similar to its MIXPAC mixing tips, since they mimic the dome shape and trademark colours of the original. However, genuine tips can be identified by the MIXPAC trademark name stamped on the retaining ring and the CANDY COLOUR quality seal stamped on the top edge.

- Non-precious dental alloys on nickel-chrome base System KN and System NH
- Non-precious dental alloys on cobalt-chrome base System NE and System Duro
- Partial alloy System MG
- CAD/CAM discs on cobalt-chrome base System NE-Blank and System Soft-Blank
- CAD/CAM disc on titanium base System TIS-Blank
- Investment for crowns and bridges ADENTA-VEST CB
- Investment for partial denture ADENTA-VEST PA
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The Clip Mirror: Increasing productivity and easing daily physical stressors

An interview with dental hygienist Patricia Blundon, Canada

By Julia Maciejek, DTI

Dental hygienist Patricia Blundon is the developer of a mirror that clips on to a saliva ejector to aid dental hygienists, therapists and assistants in treating patients. In response to growing demand for the Dental Hygiene Clip Mirror, she has introduced the device to the US market and plans to expand her business globally. Dental Tribune Online spoke with Blundon, who has 30 years’ experience and graduated from the Algonquin College of Applied Arts and Technology in Ottawa, to learn more about the mirror.

Helping to improve treatment has always been important in dentistry. Why did you decide on developing the Clip Mirror and setting up your business, D.H. Essentials?

The Clip Mirror idea came to me about ten years into my career. I was working on a patient with a super strong lower lip and a protruding tongue. With a scaler in one hand and mirror in the other and the patient’s tongue pushing out the saliva ejector, I thought to myself, “Why does this need to be so hard?” I thought about having a mirror clip directly on to the saliva ejector to free up a hand and wondered why no one had invented this. Then I thought to myself, “Who better to invent a dental tool than a dental hygienist?”

When designing the Clip Mirror, what did you pay attention to?

I knew the design I wanted and I visited a multitude of hardware stores to see what clips were available. The steel for the clip had to be medical grade and 400 series so that it would not rust or corrode with sterilization, and the clip itself was designed to snap securely to the saliva ejector while still allowing rotation if needed. I designed the rolled clip ends so one can feed a line of floss through and attach the Clip Mirror to the saliva ejector using sterile tape as an added precaution in hospital settings or compromised patients. I chose the brighter size 5 titanium mirror, as the standard rhodium plated mirror in brightness and quality in comparison, and then decided to have the clip electron beam welded by hand for the best results.

What is the importance of good ergonomics for dental hygienists and clinicians?

The key reason I designed the Clip Mirror was to make the job of dental hygienists and clinicians easier on their body and more efficient. As the population ages, dental clinicians may find themselves using a less than ideal posture while craning their necks and contorting their bodies to complete the necessary treatment. I would encourage dental care providers to try various products to find what works best for them to help maintain proper posture, as we all know dentistry can take a huge toll on one’s body.

What has user feedback been so far?

Feedback on the Clip Mirror has been great, and for those who have struggled in the past, like I have, with no help from a dental nurse or assistant, it has been a great body and time saver. Many report finding it very helpful when they have a patient who cannot recline and need to scale the maxillary lingual surface. I have received some feedback requesting a smaller mirror size for use with patients with a narrow or smaller arch and will be introducing the Clip Mirror MINI in the near future.

How has the success of the Clip Mirror been globally?

I decided to introduce the Clip Mirror to the US after years of customer interest and positive feedback from my Canadian customers. I have had customer interest from Australia, Ireland and the UK and would love to team up with a partner to serve these markets and many others. Dentistry is worldwide, so the sky is the limit.

Thank you very much for the interview.

Asia’s first Research Academy Course in Hong Kong a success

By DTI

HONG KONG: For the first time ever, Asia played host to an Osteology Research Academy Course. Held from 3 – 6 June in Hong Kong, the Core Module Course received enthusiastic feedback from participants and presenters alike, the Osteology Foundation stated.

The four-day course held in Hong Kong offered intensive education on good scientific practice and research methodology.

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The four-day course, which was jointly organised by the foundation and the University of Hong Kong’s Faculty of Dentistry, brought together 33 participants from 11 different countries, including Australia, China, Japan, Malaysia, South Korea, Taiwan and the UK. Equally international were the presenters, who came from Germany, Japan, Hong Kong, South Korea, Spain and Switzerland.

In lectures and workshops, the participants elaborated on all kinds of topics related to the field of dental and craniofacial research, including good research practice, methodology and design, as well as strategies to obtain research funding and managing research communication.

Designed for postgraduates and dentists who are more scientifically inclined, the research-focused educational courses are available as core and expert modules. So far, more than 200 young clinicians from all over the world have participated in the programme.

More information about the registration process, study grants and upcoming courses can be found at www.osteology.org/education/research-academy.

Dental hygienists have been asking about the Clip Mirror, stating they wish their employers would purchase them for their hygiene tray setups. Many have seen the value of the Clip Mirror in increasing their productivity and easing the daily physical stressors of providing dental hygiene treatment. The majority of purchases are by dental hygienists who are already suffering from a career of dental hygiene.

The four-day course held in Hong Kong offered intensive education on good scientific practice and research methodology.

The four-day course held in Hong Kong offered intensive education on good scientific practice and research methodology.
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A convincing duo: Zirconium dioxide and fluorapatite glass-ceramic

The symbiosis of different procedures and materials for simplified and safe outcomes

By Dr Torsten Seidenstricker & Dominique Vinci, Switzerland

This patient case demonstrates how a monolithic zirconium dioxide framework can ensure stability and function in a complex prosthetic restoration. The ceramic veneering of the vestibular surfaces gives the restoration natural light optical properties, contributing to the very pleasing final results.

Initial situation
A 60-year-old patient came to the dental practice as an emergency case. In addition to aesthetic and functional problems, there was severe periodontal damage. The treatment began with an in-depth diagnosis and an informative consultation. First, teeth #25, 26, 14, 16, 11 and 12 were extracted. The periodontitis was then targeted. Treatment of the periodontitis was successfully completed approximately 13 months later. Implants needed to be placed in regions #11, 12, 14, 16, 25 and 26. The clinical situation meant that all teeth in the maxilla and some teeth in the mandible had to be extracted. The periodontitis was successfully completed with an in-depth diagnosis and an informative consultation. First, teeth #25, 26, 14, 16, 11 and 12 were extracted. The periodontitis was then targeted. Treatment of the periodontitis was successfully completed approximately 13 months later. Implants needed to be placed in regions #11, 12, 14, 16, 25 and 26. The clinical situation meant that all teeth in the maxilla and some teeth in the mandible had to be extracted.

Planning and temporisation
Before starting such an extensive prosthetic reconstruction, photographic documentation of the oral situation and the patient’s face is essential. Primarily, the photographs help in assessing the axes and planes in terms of optimum aesthetics and function. We work with a 3D design program (Digital Smile Design System, DSS). This tool enables us to simulate the possible results virtually. Another advantage of this software is that the photographs can be used in the CAD software while the restoration is being produced. The teeth to be extracted were removed from the situation model, and the remaining teeth were prepared using the information provided by the dentist.

On this foundation, we designed a wax-up with the CAD software (C3Dshape) and then transferred it to wax. This was the basis for a matrix made from transparent silicone, which was sent to the practice. After the dental preparation was complete (implant placement, preparation, etc.), the matrix was filled with an auto-polymerising temporary composite (Telio CS C&B, Ivoclar Vivadent) and a temporary restoration was produced and then inserted into the mouth. The temporary restoration served as a dental prosthesis during the implant healing phase, and it allowed us to determine whether the situation, which was planned in the laboratory, harmonised in a functional and aesthetic manner in the patient’s mouth. The patient wore the adapted temporary restoration for approximately six months up to the osseointegration of the implants.

Production of the final dental restoration

Implant abutments
The wax-up was positioned on the master model and adapted based on the patient’s and dentist’s feedback. A double scan followed. We digitised both the model and the wax-up using the laboratory scanner. Subsequently, the implant abutments were produced via CAD/CAM. The implant abutments were milled from a new translucent zirconium dioxide material (IPS e.max ZirCAD, Ivoclar Vivadent). Before sintering, we stained the cervical areas of the frameworks. We used a liquid with a warm yellow tone for the infiltration. After sintering, the implant abutments were adhesively bonded to the titanium bases (TriBase, Straumann) with a luting composite (Multilink Hybrid Abutment, Shade H40, Ivoclar Vivadent) specifically designed for this indication. The self-curing composite provides excellent adhesion qualities. After adhesive bonding, the abutments were integrated.

Production of the framework
The following restorations were planned for the final prosthetic restoration: 1. a bridge in regions #10–13, 2. a bridge in regions #14–16, 3. a crown on tooth #17, 4. seven single crowns on teeth #21–24 and 27, as well as in regions #25 and 26.
We designed the tooth shape and the occlusal morphology in full anatomical contour in the CAD software. The buccal surfaces should be built up in ceramic in order to achieve optimum aesthetics. In preparation for this, the software performed a cut-back. After the framework design, the individual elements were milled from zirconium dioxide (IPS e.max ZirCAD). The material used has interesting mechanical properties, which, among other qualities, guarantee the long-term stability of the restorations. The selected shade of LT sun offers a light chroma that matched perfectly the envisaged Shade A restorations. After milling the frameworks, we corrected the morphology slightly, paying particular attention to the interdental areas. For excellent aesthetic results, we infiltrated the frameworks with the special IPS e.max ZirCAD LT colouring liquids (Ivoclar Vivadent) before sintering.

The ceramic materials (IPS e.max Ceram) for veneering the buccal areas:
- Cervical Transpa orange-pink with Special Incisal yellow 50% and Transpa neutral 50% and Power Dentin A2
- Power Incisal I for greater brightness at the transition lines
- Transpa blue 50% and Opal Effect 1 50%
- Transpa orange-grey to create a contrast in the incisal areas
- Transpa orange-grey with Special Incisal yellow on the incisal edges
- Transpa neutral
- Transpa clear 50% and Opal Effect 1 50%
- Power Incisal 2

Fig. 14: The all-ceramic restorations looked very natural and vital in the mouth.

Figs. 8a & b: Colouration of the zirconium dioxide before sintering.—Fig. 9: The zirconium dioxide frameworks prepared for veneering in the buccal area.—Fig. 10: The ceramic build-up in the anterior region (IPS e.max Ceram).—Fig. 11: Prepared for the second firing. Finely detailed adjustments in the shape and morphology.—Figs. 12a & b: The finished restorations. The vestibular areas were layered individually. In the occlusal and palatal areas, the framework was designed in full anatomical contour.—Fig. 13: Natural-looking translucency with internal shade effects.

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- Power Incisal 2

Fig. 14: The all-ceramic restorations looked very natural and vital in the mouth.
In the incisal and occlusal areas, the chroma was increased and the translucency was adapted in the appropriate areas. As only the buccal surfaces were veneered in this case, the framework volume was relatively solid. We always carry out a slow sintering procedure (9 h) in our laboratory for complex restorations, such as the reconstruction presented here. Subsequently, the surfaces of the monolithic zirconium dioxide parts were polished, paying special attention to the occlusal areas. For polishing, we used polishing cones from SHOFU or anaxdent. Those cones guarantee thorough polishing so that the surface can subsequently be easily polished to a high luster. We do not use silicone cones or discs, as they leave residues on the surface, making the application of glazing materials difficult. Areas that are difficult to access during polishing are covered with a thin glaze layer.

This was followed by a restoration try-in in the patient’s mouth. The dentist checked the occlusion and function.

Veneering

After conditioning of the framework parts to be veneered, a fluorescent liner (IPS e.max Ceram ZirLiner, Ivoclar Vivadent) was applied; this gave the restoration fluorescence from the depths in order to achieve light effects resembling that of the natural dentition. Non-fluorescent materials (e.g., pure zirconium dioxide) appear dull and dark. Since the framework was already coloured, we opted for a clear liner. This additionally enhanced the light transmission and contributed to the adhesion of the ceramic veneer to the zirconium dioxide. A classic ceramic veneer build-up was then carried out. We used a special indicator (Smile Line) to mix the ceramic powder in order to differentiate the individual materials better. The IPS e.max Ceram range includes Power materials, which provide an increased level of brightness, particularly for translucent framework materials. In this case, we decided to use the Power materials. A further advantage of the IPS e.max Ceram material is its excellent stability. The individual areas do not merge during the build-up of the ceramic veneer, allowing for the exact desired effects to be achieved. In order to achieve the correct shape, morphology and liveliness, a second firing was necessary. The restorations were then glazed and finished. We like to use the glaze material (IPS Ivocolor FLUO, Ivoclar Vivadent) in a creamy consistency.

Conclusion

In the design illustrated, only the buccal surfaces of the otherwise monolithic zirconium dioxide framework are veneered. An aesthetic and durably stable result was achieved with relatively minimal effort. The qualities of the materials are used to their full advantage. These include the excellent light optical properties of IPS e.max Ceram, in this case especially the Power materials; the high strength of zirconium dioxide; the possibility of colouring the zirconium dioxide to achieve a warmer colour effect (white zirconium dioxide is far too bright for this type of restoration, and reducing the degree of brightness would have been difficult in view of the low thickness of the veneering ceramic); and the low amount of ceramic material (this allows minimal controlled shrinkage and ensures easy handling).