CAM technology offers significant advantages compared to conventional manufacturing techniques. Fabricating high quality prosthetic restorations was always associated with time-consuming laboratory processes requiring meticulous care and experience in the dental laboratory. The application of CAD/CAM technology offers, amongst others, three significant benefits. The availability of biocompatible materials such as oxide ceramics, homogenous materials and a standardised precision as well as reasonably low costs paired with clinical versatility. There are several clinical benefits.

Oxide ceramics

Oxide ceramics were introduced to the dental market in conjunction with advancements in CAD/CAM technology, since they cannot be manufactured by conventional means. While initially the esthetic potential was in the focus of applying high-strength all ceramic restorations, the true benefit of eg Y-TZP/ZrO2 (yttria stabilised polycrystalline tetragonal zirconia) is its excellent biocompatibility paired with flexural strength values that allow for application in any area of the oral cavity for both natural teeth and dental implants. When in close contact with the surrounding tissues, the reduced plaque and bacterial accumulation as well as the development of currently undefined pseudo-attachments leads to long-term tissue stability around these components (Fig.7).

Homogenous materials and standardised precision

Casting a multi-unit framework requires a dental technician with considerable knowledge and skills, and is often associated with time consuming adjustments that the dentist and technician must perform in order to achieve an adequate fit. There are several steps that are prone to potential error. In many clinical situations, cast bars or frameworks must be sectioned and splinted intraorally during a try-in examination, followed by soldering the sections together in the laboratory to improve the fit. Soldering and resoldering can result in weakened inhomogeneous material quality at the solder joints. With the application of CAD/CAM technology restorations are not only milled about the author

Hans Geiselhöringer, first trained to become a dental technician in Germany. In 1991 and 1992, he embarked on further training in New York, USA focusing mainly on anaplastology/epi-thetics, followed by further education to become a technical business administrator, completing his studies in 1994. After this, he took up the position of business manager and laboratory manager, concentrating on implantology and ceramics until 1998. Since 1998, he has worked on an independent basis with the company he founded in Munich - a laboratory specialising in CAD/CAM technology, implantology, anaplastology as well as functional and aesthetic reconstructions. His expertise is reckoned by multinational enterprises who he advises as a consultant. Besides being a member of multiple professional organisations he is a distinguished and highly respected lecturer throughout the world, and since 2008, Hans Geiselhöringer is Global Head of the new NobelProcera and Guided Surgery business unit at Nobel Biocare, Zurich.
Versatility and low cost
One of the greatest advantages of CAD/CAM technology is its clinical versatility, not only the clinical situation, but also patients’ expectations and means can be met. Whether a low-cost non-precious alloy substructure is veneered with resin or ceramic material or a high-end all-ceramic solution is requested, whether a conventional denture set-up is retained by an overdenture bar or an implant retained removable restoration is finished with custom all ceramic restorations in close contact with the gingiva, the base components such as copings, frameworks and bars always guarantee maximum precision, material homogeneity and stability for all patients.

About the author

Dr Stefan Holst

Dr Stefan Holst studied dentistry at the Medical University of Hanover in 1998 and was appointed assistant professor at the Dental Clinic 2 – Prosthodontics, Friedrich-Alexander-University Erlangen-Nuremberg, Germany in 2001. In 2006 he completed his habilitation thesis and obtained his doctorate (Dr med dent habil) degree from the University of Erlangen-Nuremberg. His field of specialisation encompasses prosthetic dentistry with an emphasis on implantology, prosthodontics and complex interdisciplinary treatments. His research work focuses primarily on digital dentistry, all ceramic restorations and material sciences and biomechanics. Dr Holst is appointed course director, assistant professor, and senior lecturer and heads the research laboratories for digital dentistry at the Dental Clinic, University Erlangen. He has authored several papers on implant prosthodontics, aesthetics and prosthodontic subjects. Since 2009 he is Associate Editor of the Quintessence International Journal.

Fig.5: Only established and industrial manufacturing processes can ensure a consistent product quality and precision of fit (here: NobelProcera, frameless milling unit).

Fig.6: Zirconium dioxide is ideally suited for restorations in close contact with the gingiva (here: NobelProcera, Anterior Shaded Zirconia).

Fig.7a: Fig.7b:

Fig.7: Removable implant-retained overdentures have been quite cost-intensive in the past, as manufacturing required time, skills and large quantities of materials such as gold alloys and costly burn-out copings. The new CAD/CAM software system allows for complete virtual design of any type of bar structure needed following a mere scan of the master model/impression and a wax-up (a,b). Industrial manufacture will provide highly polished frameworks with excellent precision of fit and a broad range of additional attachments to be selected (c,d) – here NobelProcera Overdenture bar with Locator attachments on XiV, Friadent, implants.
The challenge of aesthetics

Markus Jedlinski explains how the HeraCeram Matrix system from Heraeus can help to create perfect aesthetic restorations.

It’s a constant challenge for dental technicians to fabricate natural, aesthetic restorations. The ability to carry out aesthetics does not require a creative spirit, but the ability to copy to produce the perfect imitation. Success, however, also depends on which materials can most perfectly imitate the optical properties of the natural tooth structure. The HeraCeram Matrix system from Heraeus has been used in the following case history.

Case study

First assessment of the initial situation indicated a highly abraded dentition (Figure 1). The patient wanted the natural tooth shape and length restored. A slight diastema was also to be closed. The purpose of treatment was to restore the anterior/canine guidance as well as to correct premature contact of the occlusion. The aim was to fabricate a perfect restoration taking aesthetic and functional aspects into consideration. In consultation...
with the dentist, it was decided that the best option was full re-
habilitation of the upper denti-
tion, which should be as mini-
mally invasive as possible.

The canine was so heavily abraded in the initial situation that the premolars had already assumed interproximal guidance (Figure 1a). The dentist there-
fore decided to raise the bite by two millimetres in order to re-
construct the anterior teeth to the correct length.

First wax-up

With very large restorations, as in this case, it is helpful to fab-
ricate a wax-up first. This is particularly practical when cor-
recting malocclusions in order to identify and remedy any faults at the beginning of treatment. The wax-up gives an idea of the planned restoration.

Before pouring the model, the impression was degreased using a silicone wetting agent to ensure a porous-free model. The dental arch was then trimmed, pinned, based and provided with a split cast.

The upper model was then mounted on an articulator ac-
cording to the cranial relation-
ship and the lower model was ar-
ticulated using a myocentric bite registration. A removable gin-
gival mask is recommended to inte-
grate the gingival situation into the subsequent working stages. A silicone index is fabri-
cated on the unsectioned work-
ing model and the mask silicone can then be syringed into the index after the model has been sawn and prepared.

Preparation under the microscope

The preparation margins were carefully exposed and marked under a microscope. The die segments were prepared for the gingival mask. The intention was to reproduce the anatomical root shape of the teeth to about the middle of the proximal area. This created an adequate thick-
ness for the gingival mask. The remaining dies were trimmed on a die trimmer, hardened with superglue and replaced in the model base. It is important to ensure accurate repositioning of the silicone index.

Mandibular excursions shou-
uld be taken into account when fabricating a diagnostic wax-up. The anterior teeth were waxed up to the premolar region using thin wax veneers of natural an-
terior teeth, which corresponded approximately to the correct shape and size (Figure 02).

Focus on the occlusal and proximal contacts

The next stage was to wax up the upper posterior teeth. When waxing up the posterior teeth particular focus should be placed on the anterior/canine guid-
ance and contour of the occlusal and proximal contacts. Only the fine details of the form and func-
tion of the teeth still had to be completed – with constant moni-
toring of the extrusion move-
ments of the mandible (Figure 5 and 4).

The advantage of such a de-
tailed, contoured wax-up is that virtually any region can be the starting point for fabricating the restoration. Try-in of the diag-
nostic wax-up provided infor-
mation relating to the axis align-
ment, midline and final tooth length. A silicone index of the wax-up was then used to fabri-
cate a veneer framework with an anatomically scaled down tooth conto-
ur (Figure 5).

The first stage after pressing was usually to devise the veneer frameworks using two-bar pres-
sure and 50 mµ glass beads. The next stage was then to sandblast the frameworks using approxi-
mately 0.7-1.0 bar. This removed any remaining investment from the framework (Figure 7).

The frameworks were also prepared under a microscope. High spots on the inside of the framework and any overextend-
ed margins were removed. The gingival mask fabricated earlier was used to check the available space (Figure 9).

The build-up concept

There was a certain amount of flexibility, as full rehabilita-
tion of the upper was planned. The patient wanted the shade to match the lower teeth. The shade of the lower teeth was between A5 and A5.5. The natural teeth also had staining. This allowed characterisation to be slightly more pronounced.

There are a number of op-
tions and techniques for fabric-
ating all-porcelain restorations. HeraCeram porcelain from Her-
aceous was selected in this case.

Dental implantology courses across the UK

Improve your surgical technique and treat more complex cases

DENSPLY FRIADENT

2010 Programme

Advanced Implantology Course
Dr Andrew Moore
Advance Dental Clinic, Chelmsford
24-25 June 18-19 Nov

Advanced Implantology Programme
Dr Dermot McNulty, Bath Spa Dentistry
Surgical Skills 4 Mar. Soft Tissue Management 7 May
Bone Grafting 24 Sep. Sinus Augmentation 12 Nov

Advanced Course for Experienced Implantologists
Dr Nigel Saynor
Bramcote Dental Implant Centre, Bramhall, Cheshire
19 Feb. 17 Sep. 19 Nov

Sinus Augmentation and Bone Grafting Course
Dr Nadir Khan and Dr Tushar Patel
Colchester Dental Referral Centre
22-23 Apr. 7-8 Oct

Sinus Lifting / Bone Grafting
Dr Mitch Badani
Devon Dental Centre of Excellence, Ashburton
Sinus Lifting 26 Mar. Bone Grafting 17 Sept

Hard and Soft Tissue Grafting
Dr Mark Diamond and Dr Dan McKenna
Fortwilliam & Whiteworse Clinics, Belfast & Londonderry
22 Jan. 26 Feb

Current Concepts in Hard & Soft Tissue Grafting
Dr Sharad Patel, Leodis Dental Studio, Jersey
Sinus Lifting and Bone Grafting 22-24 Apr. 12-13 Sep
Soft Tissue Grafting 20-22 May 22-23 Oct

ANKYLOS® ZIVE® FRIALITI® FRIOS® PePGEN P-15®
DENSPLY Friadent UK and Ireland
Leeds House, Amberley Court, County Oak Way, Cowley, West Sussex RH5 2YJ
www.courses4implants.com. Freephone: 0800 077 8650 Email: courses@friadent.net www.dentsply-friadent.com

Booking and further information
The excellent light optical results and high stability attained with HeraCeram are very beneficial for the patient – not only with respect to the aesthetics but also in terms of reliability.

**Top marks for optimum aesthetics**

High aesthetic standards are attained using the opalescent and fluorescent porcelains of the HeraCeram Matrix range (Figures 10 – 15 + 18). Opal incisal and opal transparent porcelains are used for final adjustments to the shape of the teeth (Figure 19).

After the second dentine firing, all the crowns were subject- ed to spot grinding and the fine details of the shape were adjusted. The interdental spaces were contoured to ensure that the interdental brush could be inserted by applying only light pressure to the gingiva (Figure 20).

The occlusal contact points were placed on plateaus (Figure 22) and the proximal contacts contoured spherically in order not to disrupt mandibular immediate side shift. This simplifies subsequent oral hygiene measures.

After glaze firing, the buccal surfaces were polished with pumice powder. This produces a natural abrasion effect on the ridges and a satin glaze finish.

The result: The all-porcelain restoration is impressive and not simply because of its optimal aesthetics (Figure 27 and 28).

---

**About the author**

Markus Jedlinski is a dental technician. He started his apprenticeship in 1997 in a German dental laboratory and after graduating, he’s worked at several different labs, including Jan Langner GmbH in Schwäbisch Gmünd for 1.5 years. Since 2003 he’s worked as a dental technician at Dental Technik Günther Knab GmbH in Crailsheim.

Dental Technik
Günther Knab GmbH
Markus Jedlinski
Postplatz 2
74564 Crailsheim
E-Mail: markusjedlinski@t-online.de
Yesterday's Quality, Today's Technology

Is your lab working hard to bring you excellent customer care and quality cosmetic crowns and bridge work solutions?

Does your lab offer you:

**Quality**
Perfect aesthetics for your patients, including marginal fit, occlusion, anatomical contouring and shade matching?

**Personal Service**
A solid relationship with tailor made solutions and options that fully suit the needs of your practice?

**Guarantees**
What guarantees will your lab offer you and your patients? Don’t settle for anything less than a guarantee for at least three years on everything it sells, no quibbles!

**Delivery**
Does your lab have a delivery guarantee so you can continue to schedule work and turn around cases quickly and efficiently? You shouldn’t have to wait weeks to receive quality, outstanding products.

AND 30% off your first order?

Biterite combines the standards and values of the traditional dental laboratory with the contemporary work ethics of today’s dentist. Why not talk to the team from Biterite and try the fresh approach to working with a dental laboratory to see difference for yourself?

Call 0208 455 5321 or go to www.bite-rite.co.uk

Haddon Williams is a Damas accredited dental laboratory specialising in all forms of crown and bridge work. Two of our team are members of the British Academy of Cosmetic Dentistry.

We were the first laboratory in the South West of England to purchase a cad-cam milling centre and our technicians now have over five years experience of milling zirconium crown and bridge sub structures. We have produced in excess of 10,000 units from single units to full mouth milling zirconium crown and bridge sub structures.

MedMatch dental laboratory is a fully equipped dental laboratory based in West Ealing, London. Our product line ranges from simple NHS products to complex prosthesis (IPS e.max; Cercon Zirconia; various Implant brands, Combination work, Flexible denture work, etc).

MedMatch will deliver fantastic products with the best available service for a very competitive price.

Try our services to benefit from our introductory offer, where purchase of a second unit is FREE of charge (terms and conditions apply)

A FREE UK wide collection service is available.

Give our laboratory a try and we surely will NOT disappoint you!

MedMatch Dental Laboratory
One Business Park, Unit A
Northfield Avenue
West Ealing
London
W13 1SU
T: 08444990888
M: 07710283356
www.medmatch.co.uk

Have you claimed your free gift yet?
Stuart R. Hulley dental laboratory offers you the unrivalled ceramic IPS e.max plus over 20 years experience to deliver more aesthetic restorations for your patients.

We have teamed up with Invacare Vidalent to offer you a free gift, call us today and request a brochure to receive your free gift voucher!

Our Laboratory is based in Ashton-under-Lyne near Manchester, we serve a wide range of practices reaching as far asfield as Southern Ireland.

Our Success is built on a commitment to excellence and an ongoing programme of investment in the latest technology.

If your patient wants the truly exceptional aesthetics delivered by the IPS e.max, and you would like to work with a team that share your passion for excellence then call us today to receive our brochure, which includes examples of our fantastic work and pick up your free gift today.

Contact Stuart R. Hulley 0161 330 6868