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The Maltese Dental Journal



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Editorial

By Dr David Muscat

Dear colleagues,

At the time of writing this article there is a currently lot of discussion regarding the warranting of dental students in Malta.

There was an AGM on 2nd February in which the non-EU dentists issue was discussed. The IRO Officer, Dr Audrey Camilleri, and the The Treasurer, Dr Noel Manche presented their respective report.. The President Dr Edward Fenech outlined the outcome of a meeting he and Dr Chris Satariano had with the Health Minister regarding the warranting of newly qualified dentists. Dr Adam Bartolo reported on a meeting he had with the VAT department about cosmetic and aesthetic procedures.

Dr Chris Satariano has decided not to stand again for elections. At the AGM since only one other dentist Dr Thomas Grixti had been nominated for the committee, he replaced Dr Chris Satariano without the need of an election. We thank Dr Chris Satariano for his many years of loyal and sterling work and we welcome Dr Thomas Grixti.

Several dentists have offered their input and ideas regarding the problem

with the shortage of dentists who are needed to work at Mater Dei. An EGM was held on 2 March. At this EGM representatives of the dental students MADS were invited to attend. The outcome of the meeting was a clear vote for postgraduate training for new graduates but this has to be voluntary and not mandatory. The UOM made it clear they are not in favour of withholding the warrant for newly graduated professionals. The course is fully aligned with the ADEE learning outcomes expected from the graduating dentist in order to practice as a safe professional. The external examiners have consistently praised the overall delivery of the dental course. There are mixed thoughts on whether the graduates should contribute back to the state.

Some lecturers feel that the students carry out sufficient clinical work as undergraduates to contribute back to the state. A properly structured programme with a clinical logbook for junior dentists would definitely be beneficial to them.

There has to be a career pathway and the various dental disciplines may be taught in the hospital (e.g. oral surgery and orthodontics) but also at other subject venues such as UOM (e.g. digital

dentistry ,endodontics) or certain vetted dental private practices (e.g. crown and bridge, prosthodontics, implantology). The meeting was a resounding success and the students expressed publicly that, after listening to all the people who spoke at the meeting, they feel that there are people out there who actually care about their careers and would like to help them. Third year dental student Gabriel Sciberras spoke on behalf of the dental students. The DAM has made it clear that we care about their future. It is certainly a very unsettling time for them. These are our future members.

On 3 March there was an evening course organised by Invisalign. There is another hands-on GC course being held at Cherubino by Dr Ann Meli Attard on 28 April.

Many dentists are attending the IDS , a leading global trade fair for the dental community in Cologne this year. The St Apollonia event, this year on 10 February, was a resounding success notwithstanding the severe stormy weather that day. Many thanks to Dr Lino Said for organising this event once again.

The front page is a picture of a painting of St Barbara Bastions by the artist Jacqui Agius.

David

Dr David Muscat B.D.S. (LON)
Editor / Secretary, P.R.O. D.A.M.

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DAM CHRISTMAS PARTY



The DAM Christmas party was held at Madliena Lodge and was a resounding success with a fantastic turnout. Klinsmanns band was in attendance.



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THE DENTAL ASSOCIATION OF MALTA

Administrative Report for the year 2022

By Dr David Muscat B.D.S. (LON), Secretary – DAM

In 2022 the DAM committee had twelve committee meetings some of which were held online.

Our last AGM was held at the Federation on 24/2/2022.

Dr Chris Satariano as our representative on the Federation had countless meetings with the other representatives of the other professional Associations regarding proposed changes to the statute and also regarding the future of the Federation amongst many other topics.

Dr Audrey Camilleri our IRO officer has represented the DAM at two CED meetings abroad and her report will be published in the next Probe issue.

Dr Adam Bartolo has worked as our representative on the SAC. He has also liaised with our legal advisor on certain legal issues.

The DAM subcommittee on the KA1 project namely Drs Noel Manche and Nicholas Busuttill Dougall successfully organised three separate weekly courses in conjunction with Zirkonzahn in Northern Italy. Each course was attended by six dentists and an organiser. Funds for the course were obtained from EUPA.

The DAM has had meetings in preparation for the next Mediterranean Dental Conference. We are co-operating with the UOM regarding this event.

The DAM has grown in number and in strength and boasts

the vast majority of registered dentists who actually practise and live in Malta as members.

This year we organised three CPD events namely a lecture on Bisphosphonates by Professor Borg, an update on Anterior tooth trauma by Dr. Audrey Camilleri both sponsored by Pro Health and a hands on course by Dr. Ann Meli Attard in conjunction with GC-Cherubino Ltd. A medico historical lecture by Cardio Thoracic surgeon Mr. Alex Manche was also organised with kind sponsorship by Chemimart.

It has been decided to resume the 'Basic Life Support' day courses since now Covid19 does not seem to be a major problem.

The DAM has through the year kept an eye on aggressive advertising from overseas and has taken steps to bring this to the attention of the authorities.

There is still a problem with local patients going to Turkey for their treatment and returning with major issues. The DAM has gone to the press and made its voice heard and expressed its concerns.

The DAM takes a dim view of the recent registration of non EU dentists to work at Mater Dei especially when there is an exam which is organised for these dentists especially to ensure patient safety.

The DAM is currently planning to organise further CPD lectures and events both here and abroad.



We mourn the loss of Dr Ethel Vento Zahra who was once a member of our DAM committee and one who attended every DAM AGM that I can recall. She was always there to help and advise others. She is missed.

We had a very successful DAM Christmas party with over 90 attending recently at Madliena Lodge and this was very encouraging.

We look forward to next year which will be of course full of new challenges which we will face and tackle. We have a good team: Dedicated. Active. Motivated. 🇲🇹



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THE DENTAL ASSOCIATION OF MALTA

International Relations Officer Report for 2022



By Audrey Camilleri
International Liaison Officer,
Dental Association of Malta

In November 2023 I attended the CED meeting where representatives of the Council of European Dentists (CED) Member, Affiliate Member and Observer associations met in Brussels, Belgium, for the CED General Meeting.

The following are the topics that were discussed:

ANTIMICROBIAL RESISTANCE (AMR)

The WG continues to participate in meetings of the AMR Stakeholder Network Group (AMR SNG). The CED is waiting for the results of its application to become a stakeholder within the AMR One Health Network, organised by the European Commission. Harry-Sam Selikowitz has been nominated as CED representative.

In October, the CED also replied to a consultation on the AMR Future Proofing Plan launched by the European Commission and participated in an event on AMR held in the European Parliament. The CED also engaged online on the European Antimicrobial Awareness Day, which took place in November.

CANCER

The Chair shared information on the latest adopted up-to-date European cancer screening recommendations.

VACCINATION

The CED shared with its members the latest EC campaign on vaccination against COVID-19 and

influenza and will continue through its social media engagement to bring awareness on the topic. The IMMUNION project will hold its last meeting at the end of 2022.

EUROPEAN MEDICINES AGENCY

Ivana Silva joined the GM and presented on 1) the European Medicines Agency functioning and activities, 2) the process of medicines approval through the centralised EMA procedure, 3) the ways EMA supports innovation and research on medicines, 4) the EMA monitoring of the safety of medicines already on the market, 5) the EMA extended mandate, 6) the EMA stakeholder engagement and targeted communications towards healthcare stakeholders.

Ivana Silva highlighted that collaboration with healthcare professionals such as dentists is crucial for the EMA, in order to access the best possible independent expertise in clinical practice, to incorporate the real-world experience of the full spectrum of healthcare (from primary, to secondary and tertiary care) into drug development, benefit/risk evaluation and monitoring.

CORPORATE DENTISTRY

The Chair reminded that the survey on corporate dentistry was launched in September and received feedback from 24 CED member countries.

Continues on page 8.

International Relations Officer Report for 2022

Continues from page 7.

The members provided a lot of additional information, links, examples. It offered a good snapshot of the variations and similarities on corporate dentistry among countries.

WHO DRAFT GLOBAL STRATEGY ON ORAL HEALTH

The WG discussed the WHO Draft Global Strategy on Oral Health. The document contains recommendations on the recognition of mid-level providers that, according to the WG, could be counterproductive if applied in the European countries where these professions currently do not exist.

STATEMENT ON SPECIALTIES

The WG decided to amend the Statement on specialties to include the acknowledgment of the current trend toward the specialisation of the profession. The amendment will not change the CED neutrality toward the recognition of specialisations. The document will continue to stress that the general dentist is qualified to perform all activities performed by specialist dentists.

RECOGNITION OF QUALIFICATIONS OF THIRD COUNTRY NATIONALS

Due to skills shortages in key sectors, a new supranational proposal on the issue is expected to be presented in 2023. The WG will prepare a questionnaire on the recognition of qualifications of third country nationals with the aim to potentially prepare a Position Paper on the topic.

PROFILE OF THE DENTIST OF THE FUTURE

The WG decided that it will work on an update of the document, to reflect the changes that dentistry is undergoing.

MANDATE UPDATE

The WG prepared a proposal for an update of its mandate. Ahead of the GM, two further suggestions for the mandate were received on behalf of Michael Frank.

It was clarified that 1) in connection to point 6, the amendment suggestion aims at making it clear that the CED will not be promoting new specialist dental degrees, 2) under point 7, the intention is that the CED should monitor the development of Common Training Frameworks for all health professions, not just dental professions.

Following reports about legal regulations and administrative procedures in some EU Member States (namely Malta and Poland) regarding access to the profession of dentists with qualifications obtained outside the EU, the GM also adopted a Statement on recognition of dental qualifications (CED-DOC-2022-053-FIN-E), emphasising that in every case there has to be a recognition procedure carried out which is complete and allows to determine that the qualifications of the dentist are in accordance with the applicable EU requirements.

- The GM adopted the amended mandate of CED WG Education and Professional Qualifications



Following reports about legal regulations and administrative procedures in some EU Member States regarding access to the profession of dentists with qualifications obtained outside the EU, the GM also adopted a Statement on recognition of dental qualifications (CED-DOC-2022-053-FIN-E), emphasising that in every case there has to be a recognition procedure carried out which is complete and allows to determine that the qualifications of the dentist are in accordance with the applicable EU requirements:

- 2 recent documents of the European Commission regarding recognition of third country qualifications which were published in 2020 (in relation to COVID pandemic) and in 2022 (in relation to war in Ukraine and the influx of refugees):

Continues on page 10.

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International Relations Officer Report for 2022

Continues from page 8.

- **COMMUNICATION FROM THE COMMISSION**
Guidance on free movement of health professionals and minimum harmonisation of training in relation to COVID-19 emergency measures – recommendations regarding Directive 2005/36/EC
- [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020XC0508\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020XC0508(01)&from=EN)
- **COMMISSION RECOMMENDATION (EU) 2022/554** of 5 April 2022 on the recognition of qualifications for people fleeing Russia's invasion of Ukraine <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022H0554>
- They clearly say that the recognition of health professionals with diplomas from outside the EU/EFTA is granted according to national procedures in the Member States. However, for health professions where minimum training requirements are harmonised at EU level, the EU minimum training requirements must be respected (Article 2(2) of the Directive).

CED'S AMALGAM STRATEGY

As part of the ongoing process on the Revision of Regulation (EU) 2017/852 on Mercury, the subgroup on dental amalgam continues contributing to

the process, highlighting the CED's position. The envisioned next steps for CED focus on continuing calling for phase down instead of phase out, and underlining the importance of respecting Member States (MS) individual national circumstances and actions on amalgam phase down. A CED members mailing on amalgam and the Mercury Regulation specifically will be sent in the beginning of 2023; the mailing will also encourage members to reach out to their national environmental and health ministries as the file on the Mercury Regulation progresses to the next stage and is taken up by the Council and European Parliament.

MEDICAL DEVICES REGULATION (MDR)

Manufacturers and notified bodies remain highly concerned about the MDR timelines and continue calling for more time for solutions to be implemented to ensure compliance.

The manufacturers' representatives state that this ongoing problem could lead to product shortages and product discontinuations for various medical devices.

In light of these issues and the fact that dental medical devices will also be impacted, the WG DMMD worked on and developed a CED statement on MDR implementation.

The statement has three main asks: 1) Increase the number of Notified Bodies under MDR, 2) Extend validity of certificates under the Medical Devices Directives permanently and

without restrictions 3) Extend the transition period under MDR until at least 27 May 2026 (from 27 May 2024).

The incorporation of the topic of cobalt-based medical devices in the statement was also recommended since the ongoing concern about cobalt-based medical devices in relation to MDR remains.

EUROPEAN HEALTH DATA SPACE (EHDS)

The EHDS is now being discussed at the European Parliament and at Council level. As the legislative process is moving forward, it is important to monitor progress and to engage with relevant input in the form of amendments and key points for policymakers. Since the engagement on EHDS will continue at WG level, the main concerns and considerations for dentistry were outlined in a WG document that was also presented to the CED Board.

ARTIFICIAL INTELLIGENCE (AI)

- AI and orthodontics: the WG eHealth started working on a paper on AI and orthodontics, especially in relation to remote orthodontics. A first, baseline version of the paper is currently being discussed by the WG members, allowing for additional arguments and key points to be included. The WG will aim to present the paper for GM adoption in May 2023. 📄

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DIGITAL WORKFLOW USING THE FACE HUNTER®

By Dr Bettina Chircop M.D.S

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The continuous advancement of digital technologies has led to major improvements in dental workflows. The use of intraoral scanners and CAD/CAM technology has now become commonplace in dentistry. More recently facial scanners have gotten a foothold in the digital workflow.

This technology uses an optical scanner to digitally capture and construct a detailed 3-d representation of a patient's face. This is then used to design and manufacture more accurate dental prostheses. The facial scanner sold by Zirzonzahn® is the Face Hunter®. Apart from the optical scanner itself the system also includes a flash, a tripod and numerous transfer forks (Image 1).

The dentist starts the digitalizing process by means of marking reference points directly onto the patient's face. This will help facilitate the dental technician to align the 3-d scans with the digital articulator later on. From the sagittal plane the ala point, the tragus point and the jaw angle are marked (Image 2). Whilst from the front the nasion point and subnasal point are also marked (Image 3).

The Face Hunter® must always be at the shoulder height of the patient and approximately 70cm away from the patient (Image 4).

The first scans are captured with the patient in neutral expression from a frontal angle (Image 5), 45-degrees to the right (Image 6) and 45-degrees to the left (Image 7). Then secondary scans are taken with the patient using different facial expressions, for example smiling and open-mouthed

(Image 8). The next scan is taken with a transfer fork attached to the patient's upper arch by means of a silicone impression material (Image 9). This is used to help the technician align the digital models to the patient's 3-d scans later on. The final scan is taken with the Plane Finder® (Image 10) as mentioned by Dr Simon Muscat in the Sep22 edition of The Probe. This is used to find the natural head position and the occlusal plane angle.

The dentist continues the process of digitalization of the patient's face by taking impressions of the upper and lower arches by means of an intra-oral scanner. The dentist can also take a scan of the transfer fork or else it can be sent to the dental technician if it can be scanned in house.

Once the registration process of all the above is completed it is then sent to the dental technician who will match up the scans with each other (Figure 11). Then by means of the previously taken reference points he will be able to mount them on a digital articulator of the dentist's choice (Figure 12). The technician now has all the information needed to produce an individualized dental prosthesis using digital softwares.

This system is ideal in complex prosthetic cases that do not have any fixed points for orientation. The software by means of the anatomical landmarks marked on the facial scans can find the Frankfurt horizontal line, Camper's line and the Ala-tragus line in-order to align the occlusal plane exactly where nature intended it to be. This can then be compared to the occlusal plane found by using the Plane Finder®, therefore giving more accurate results.

Complex anterior prosthetic cases would also greatly benefit from the Face Hunter® as it is possible to integrate the facial scans directly into the CAD software. Therefore one can use the patient's facial scan to create a 3D virtual design proposal which will allow for faster and better communication with both the technician and the patient.

The Face Hunter® is a very efficient and accurate mode of transferring data from the dentist to the dental technician. However, although most design softwares and digital scanners are compatible with Zirzonzahn® products and softwares, their system is more efficient when using the whole Zirzonzahn® system together. It also necessitates the need for a dental technician willing to train in digital dentistry and learn how to use the Zirzonzahn Plane System®. Therefore it would require a large investment of both time and money for both the dentist and the dental technician. 📄

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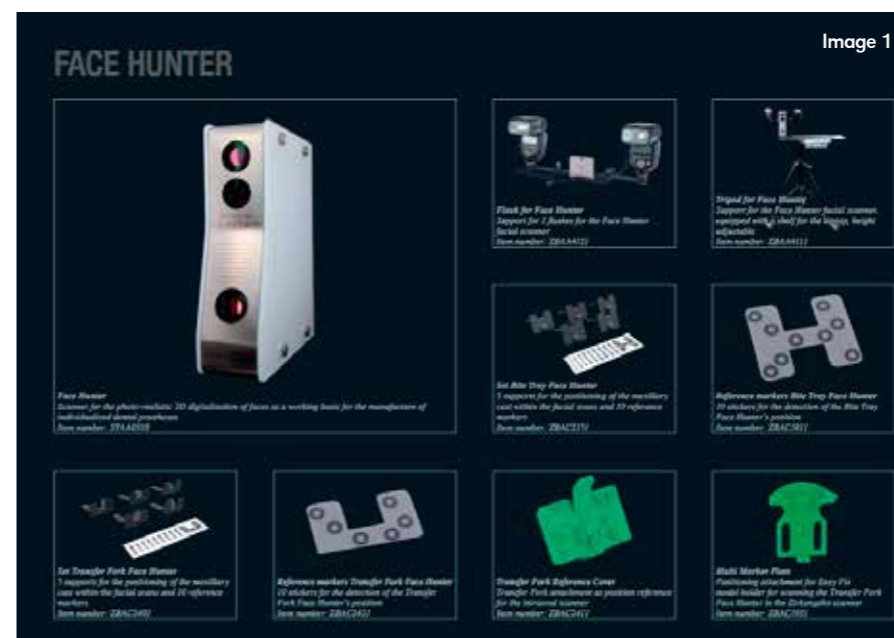


Image 2



Image 3

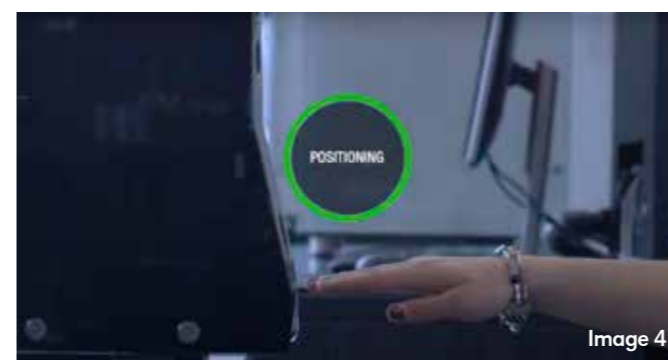


Image 4

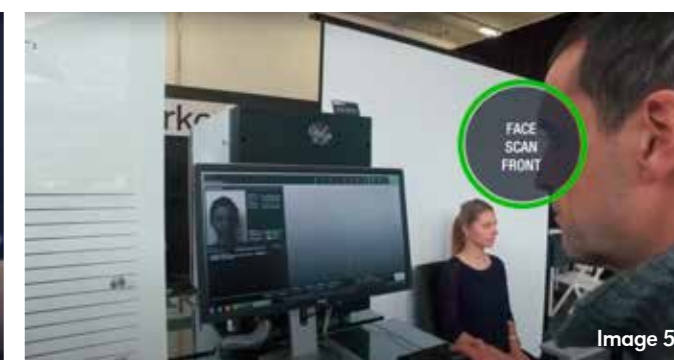


Image 5



Image 6



Image 7



Image 8



Image 9



Image 10



Image 11



Image 12

CERAMIC IMPLANTS ARE THEY A VIABLE ALTERNATIVE?

By Dr Daniel Cassar Darien DDS Ath MJDF RCS Eng MFDS RCPS Glas



One of the newer additions to the dental implantology world has been the ceramic implant. Is it really worth considering when the classical material of choice titanium has been around so long and is backed with over 60 years of scientific evidence and decades of clinical cases? Titanium is still the go to implant material choice for most indications from single restorations to the most complex cases of total rehabilitation.

Titanium presents a high degree of durability with high resistance to external forces with implant fractures rare. However some patients might have an aversion to metal being placed in their body. Allergy or hypersensitivity to titanium although very rare (less than 0.6% in a recent study) can be potential concern. Most failures will occur with patient hygiene factors and/or osseointegration failure. (1,2,3,4,5,6)

Aesthetic appearance is undoubtedly the largest concern with metal implants. Titanium might be visible through gingival tissue, especially with thin gingival biotypes. This might be accentuated over time if any recession occurs. (Figure 1)

Some discolouration or darkening of the soft tissues can also occur over a period of time from ions leeching into the tissues. In highly critical aesthetic cases this can pose a challenge which can be resolved with the use of ceramic implants especially in patient with a high smile line.

Whilst the aesthetic appeal of ceramic implants is of course undeniable one needs to keep in mind that



Figure 1

an increasing amount of patients have a natural aversion to metal being placed inside their body.

From a biological perspective soft tissue attachment, inflammatory responses and osseointegration are similar to titanium implants. Ceramic seems to have a lower affinity for plaque retention and bacterial adhesion than titanium. (7,8,9,10,11,12) (Figure 2)

There are however a number of challenges associated with ceramic implants. The material qualities offer less flexibility in use and the increased brittleness demand a higher level of care and precision.

Until recently most systems were one piece cement retained which offer less flexibility than two parts secured by torqued screws. Newer systems incorporating carbon

fibre screws are now available. (13,14,15,16,17) (Figure 3) There is no doubt that ceramic implants are as yet a niche market but one which is expected to grow strongly over the next years. Comparisons have been made on fact with the rapid rise of composite posterior restorations in the nineties. There is no question that ceramic implants are here to stay and have a definite place in every implantologist's armamentarium. 🦷

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Figure 2



Figure 3



Saint Apollonia, 10 February 2023

This year the feast of Saint Apollonia was celebrated with a mass by Father Mark Sultana at the Oratory of Saint Dominic's Priory in Valletta.

the sailors who used to pray at the small chapel the Dominicans had prior to the church being built .to thank the Mother of God upon their safe return to harbour.

Following the mass these was a short talk by Father Mark Camilleri on the history of the Oratory and a cultural lecture by Professor George Camilleri.

The land upon which the church and convent are built were given to the order by Grand Master Pierre de Monte. Girolomo Cassar was commissioned to draw up the plans. The parish was established on 2 July 1571 by a decree given by Pope Pius V, considered a s a benefactor of Valletta.It was dedicated to Our Lady of Safe Haven because of

A restoration programme is ongoing on the pipe organ of the church. Recently a silver hanging lamp over 100 years old was restored. This lamp had replaced an antique silver lamp together with seven big candle holders which was stolen by French soldiers during the French occupation from 1798 to 1800.

Afterwards the group went to lunch at D'Office restaurant.

This year there was very good turnout for the occasion and this is very encouraging. This was notwithstanding a major storm and nationwide power cuts that day. Thank you Dr Lino Said for organising it. 🙏

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PROCESSING OF ZIRCONIA FOR USE IN DENTISTRY

By Nicholas Bonnici MDS, MFDS RCSEd



Zirconia (zirconium dioxide, ZrO₂), also called “ceramic steel”, is a material commonly used in dentistry as it possesses ideal properties for dental use, including superior toughness, strength, and fatigue resistance, as well as excellent wear properties and biocompatibility.

Zirconia posts, crowns, bridges, and implants are examples of dental applications (Bona, Pecho, & Alessandretti, 2015).

During our visit to the Zirkonzahn facilities last November, in beautiful South Tyrol, we were given a tour of the headquarters where zirconia powder is refined and pressed into blanks. What follows is a brief description of how zirconium dioxide is processed to be used in dentistry.

Zirconia is a high-performance ceramic, non-metallic, inorganic material and is the most commercially significant zircon oxide. It is a compound of the element zirconium (Zr) and is found in the mineral baddeleyite in its most natural form. However, zirconium dioxide may be chemically produced from zircon (ZrSiO₄) (Bona et al., 2015).

Zircon is mined mostly in Australia and South Africa and may be used as coarse sand or crushed to a fine powder known as zircon flour. Zircon sand is utilized in the casting and foundry industries, whereas zircon flour is largely utilized in the ceramics industry. Different methods are employed to obtain zirconia from zircon. Although the processes differ, they share three characteristics:

1. They all involve the chemical, thermal, or mechanical disintegration of zircon.

2. Solubility differentiation is used to treat all compounds derived from zircon breakdown.
3. All methods are concerned with the separation of zirconium compounds from residual contaminants.

After the zirconium dioxide is produced, it is then ground into a fine powder, and is washed and purified through a process called leaching to remove any remaining impurities.

Once at the Zirkonzahn headquarters, the zirconia powder is pressed into a shape, typically a block or disc; and “green blocks” are produced. Zirconia structures for dental application are made via two methods using CAD-CAM (computer-aided design and computer-aided manufacturing) technology.

One approach grinds the completely sintered zirconia block into the final structure with no distortion (shrinkage). However, this results in great wear of the burs and the population of flaws formed during machining, which may reduce the mechanical reliability of the structure.

In the other approach, the zirconia structure is milled from a pre-sintered block, achieving its ultimate mechanical characteristics when sintered, resulting in structural shrinkage that may be somewhat corrected for during the design stage (Silva et al., 2017; Zhang & Lawn., 2018). At Zirkonzahn, this second approach is employed; from the soft zirconia blank, a dental restoration is machined using tungsten milling tools into the desired form and then sintered in a sintering furnace at 1500oC or 1600oC. The framework milled from the chalky green blocks is enlarged by 25% and

the frame's final 1:1 size is achieved by shrinkage during the final sinter fire.

Through the sintering process, the frame acquires the final flexural strength and hardness by compaction of the material particles. Sintering is achieved by temperature-dependent diffusion processes. To increase the speed of this process, sintering can be carried out under pressure in addition to heat. This is called hot pressing or hot isostatic pressing (“hipping”).

Only by this combustion process does zirconia attain its final hardness and resistance. During the combustion process, the zirconia maintains a constant shrinking value, leading to high fit precision. Sinter additives influence the sinter process and characteristics of the final material, while auxiliary additives facilitate workability.

Sinter additives remain in the zirconium oxide, whereas auxiliary additives (mostly volatile organic molecules other than water) are removed from the material prior to sintering, leaving no residue.

Zirkonzahn zirconia is partly stabilized with yttrium and enriched with aluminium which impart the required properties of high flexural strength and hardness to the material. Dental zirconia is most often, a modified yttria (Y₂O₃) tetragonal zirconia polycrystal (Y-TZP).

There are many Y-TZP variations based on additives and dopants, sintering profiles, and subsequent heat treatments (Zhang & Lawn., 2018).

Continues on page 23.

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1. Amalaradjou, M. and Venkitanarayanan, K. (2014) "Antibiofilm effect of octenidine hydrochloride on Staphylococcus aureus, MRSA and Vrsa," Pathogens, 3(2), pp. 404–416. Available at: <https://doi.org/10.3390/pathogens3020404>.

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4. Concerning discolouration of teeth: A cosmetic study with 53 subjects has shown that 94% of the subjects did not show any discolouration after a period of application of 4 weeks. Measurement method: vital scale

PROCESSING OF ZIRCONIA FOR USE IN DENTISTRY

Continues from page 21.

Yttria is added to stabilize the crystal structure transformation during firing at an elevated temperature and improve the physical properties of zirconia.

Zirconia exists in three different crystallographic forms: cubic, tetragonal and monoclinic phases. Upon heating, the monoclinic phase of zirconia starts transforming to the tetragonal phase; complete at 1206°C.

When cooling, tetragonal to monoclinic transformation occurs. During this zirconia phase transformation, ceramic cracks could form if no stabilizing oxides were used since the monoclinic configuration occupies about 4% more volume than the tetragonal configuration. Ceria (CeO₂), yttria (Y₂O₃), alumina (Al₂O₃), magnesia (MgO) and calcia (CaO) have therefore been used as stabilizing oxides.

As the monoclinic phase does not form under these cooling conditions, the cubic and tetragonal phases are retained, and crack formation, due to phase transformation, is avoided. Zirconia-based ceramics used for biomedical purposes typically exist as metastable tetragonal partially stabilized zirconia (PSZ) at room temperature.

Metastable means that trapped energy still exists within the material to drive it back to the monoclinic phase. Highly localized stress ahead of a propagating crack is sufficient to trigger zirconia grains to transform to the monoclinic phase in the vicinity of the crack tip.

This results in a small volume increase (4%), essentially squeezing the crack to close and increasing toughness. This is known as transformation

toughening (Bona et al.,2015; Silva et al.,2017; Zhang & Lawn., 2018).

Because more cosmetic, multi-layered, restorations are more prone to chipping or delamination, a trend toward the use of monolithic restorations has transformed the way the dental team constructs all-ceramic dental prostheses.

Monolithic Y-TZP restorations with appropriate surface finishing are unlikely to wear the antagonist element substantially. Furthermore, the evolution of CAD-CAM systems and use of the most advanced five-axis milling systems has resulted in acceptable marginal discrepancy (Silva et al.,2017).

Another advantage of monolithic zirconia restorations is that less tooth structure is needed to be removed since veneering over the ceramic is not required, so the restorations can be made thinner (Zhang & Lawn., 2018).

Zirconia can be coloured and shaped to mimic the appearance of natural teeth. It has a dull white colour, and its opacity may conceal underlying structures. Individual colouring in predefined hues is possible due to this inherent white base.

Pre-coloured monolithic zirconia blocks can be made from a powder that has been synthesized with colours or a powder that has been combined with pigments to form pre-coloured, pre-sintered, zirconia blocks with a homogenous shade (Silva et al.,2017).

Improved translucency of the novel zirconia materials is obtained by reduced restoration thickness and via microstructural alterations such as decreased alumina content, increased density, decreased grain size, addition of cubic zirconia, and decreased impurities and structural flaws (Silva

et al.,2017). Zirkonzahn produces fully-contoured (anatomically formed) zirconia dental restorations with various translucency qualities, such as ICE Zirkon Translucent for layering with ceramics, Prettau Zirconia ideal for large restorations and Prettau® Anterior®, for very aesthetic needs.

Chemical composition and processing methods very much determine the quality characteristics of the end-product. The purity of the material is crucial for its solidity and biocompatibility.

Therefore, high-quality raw material is characterised by exceptional flexural strength, hardness and constant dimensional properties.

In conclusion, zirconia is a versatile material that has been widely used in the field of dentistry. The processing of zircon for use in dentistry includes several steps and the zirconia produced as a result of this process is biocompatible and durable, making it an ideal choice for dental applications. With advancements in technology, the use of zirconia in dentistry is expected to continue to grow in the future. ■

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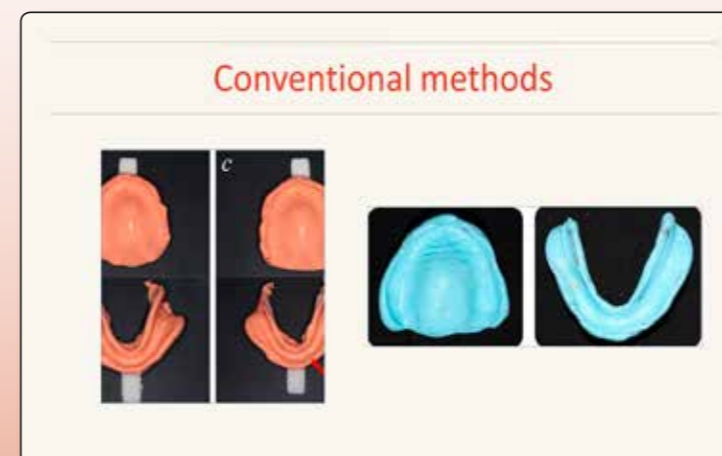
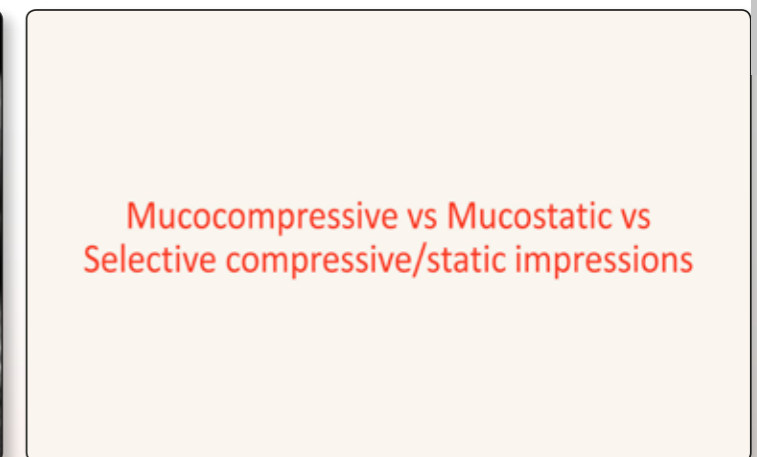
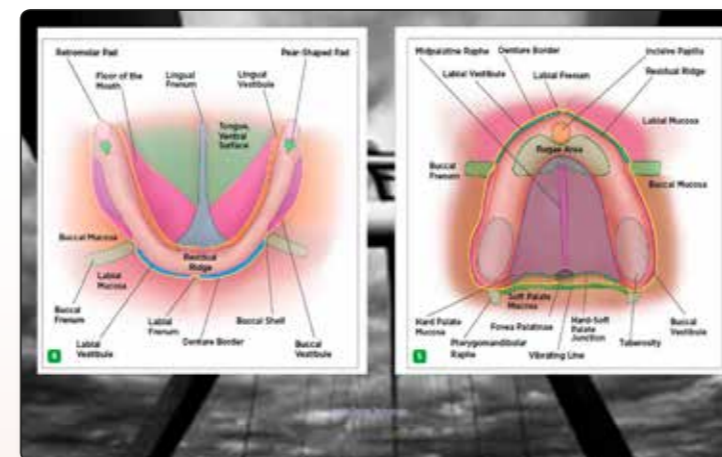
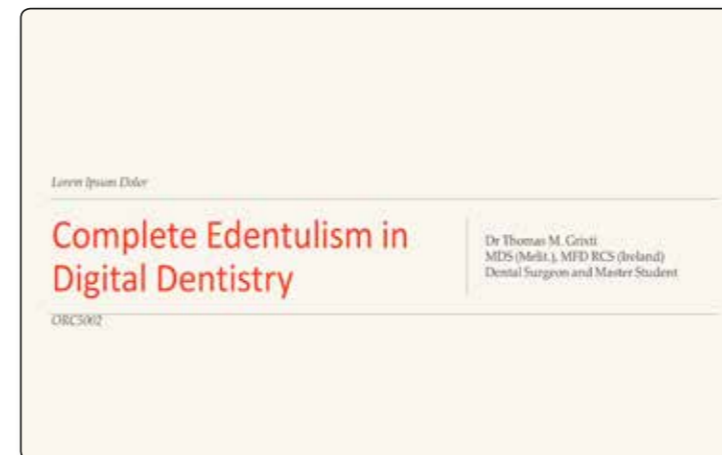


SPANISH PATENT
NR. 20 1031 133



COMPLETE EDENTULISM IN DIGITAL DENTISTRY

By Dr Thomas M. Gixti MDS (Melit.), MFD RCS (Ireland)
Dental Surgeon and Master Student



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COMPLETE EDENTULISM IN DIGITAL DENTISTRY

Continues from page 25.

Digital Methods

- Novel modality
- Relatively limited
- Accuracy and Trueness

Proposed Techniques

Digital intraoral scanning technique for edentulous jaws

Jing-Huan et al. 2017

TECHNIQUE

- Before scanning, clean and dry the hard palate with cotton rolls and air syring.
- Inject flowable composite resin (Charmed Flow; Dentist Inc) to 6 different sites on the hard palate in a half-sphere shape with a diameter of 1 or 2 mm and light-polymerize the resin.
- After polymerizing, apply bioscayl glue (B. Braun; Anesclap AG) to the resin marker areas to secure the markers, either as minute-drops or as a very thin film along the borders of the markers. After applying the glue, wait 30 seconds to allow the adhesive to dry completely.
- Scan the edentulous area with an intraoral scanner (TRIOS3; 3Shape A/S) (Fig. 2). After scanning, remove the markers with cotton pliers.
- Delete the marker image in the scanned edentulous ridge image (Fig. 3).

Figure 1. Scanned image produced with intraoral scanner (TRIOS3) using resin markers placed on hard palate.

Figure 3. Scanned image after detaching resin markers in scanned edentulous ridge image.

Conclusion

Engelblawer et al. 2017

"Studies on the use of intraoral scanners in direct digital impressions of edentulous jaws are needed to determine whether the accuracy of digital impressions for edentulous jaws is clinically acceptable."

In Vivo?

Computerized optical impression making of edentulous jaws - An in vivo feasibility study

Hack et al. 2020

- Aim: The aim of the present study was to investigate the feasibility and accuracy of COIM (computerized optical impression making) of edentulous jaws in an in vivo experiment. Additionally, the obtained data was compared to the conventional approach of impression making and the resulting stone casts (gold standard).
- Methods:
 - 40 fully edentulous subjects
 - Intraoral scan + conventional impression (CI) in PVS
 - Desktop scanner for CI and stone cast after pouring CI.
 - Both digital scans compared for discrepancies.

In vivo?

Computerized optical impression making of edentulous jaws - An in vivo feasibility study

Hack et al. 2020

Fig. 11. Exemplary color-coded surface maps of a maxillary conventional impression (COIM) impression showing highest deviations and missing data (grey areas) to the half-sphere area, the methods, and some of the data from COIM impression optical impression making.

In vivo?

Computerized optical impression making of edentulous jaws - An in vivo feasibility study

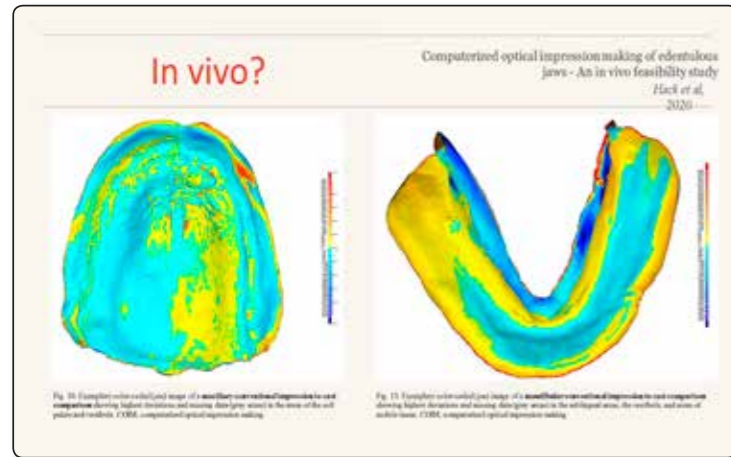
Hack et al. 2020

Fig. 12. Exemplary color-coded surface maps of a mandibular conventional impression (COIM) impression showing highest deviations and missing data (grey areas) to the half-sphere area, the methods, and some of the data from COIM impression optical impression making.

Continues on page 27.

COMPLETE EDENTULISM IN DIGITAL DENTISTRY

Continues from page 27.



Computerized optical impression making of edentulous jaws - An in vivo feasibility study
Hack et al. 2020

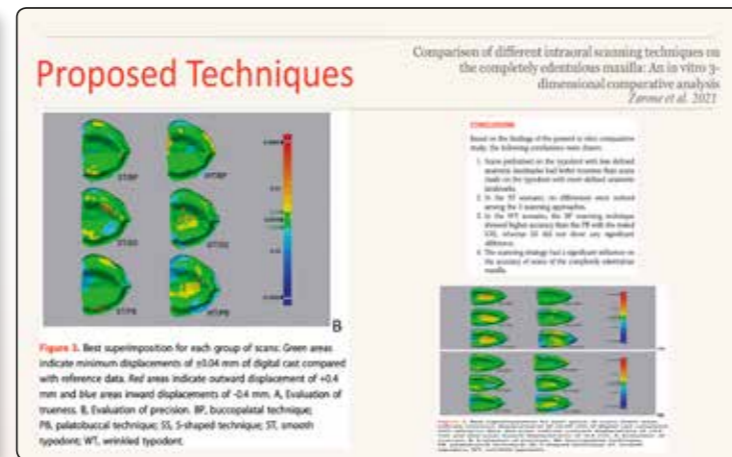
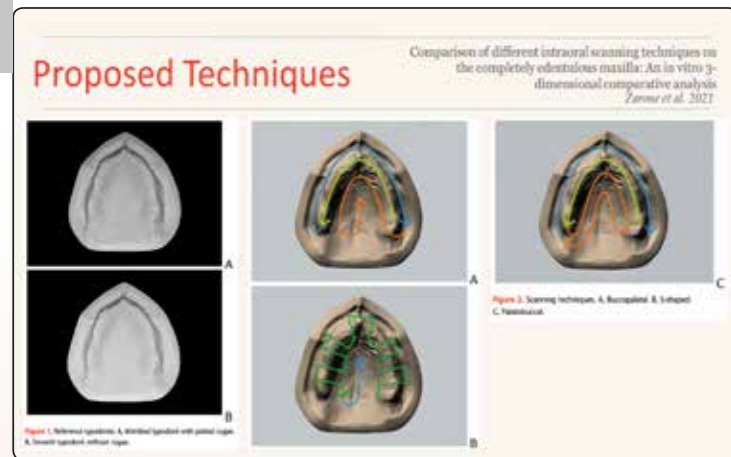
Levent İsmail Döner · Hack et al. 2020

Conclusion

"As shown in the present investigation, the investigated scanners were not able to replace the conventional impressions in all aspects, especially when it comes to the digitization of mobile tissue such as the peripheral seal zone."

"Technical and software-related improvements are necessary to be able to capture mobile soft tissue sufficiently."

What about intraoral scanning techniques/manoeuvring?



Precision and Trueness

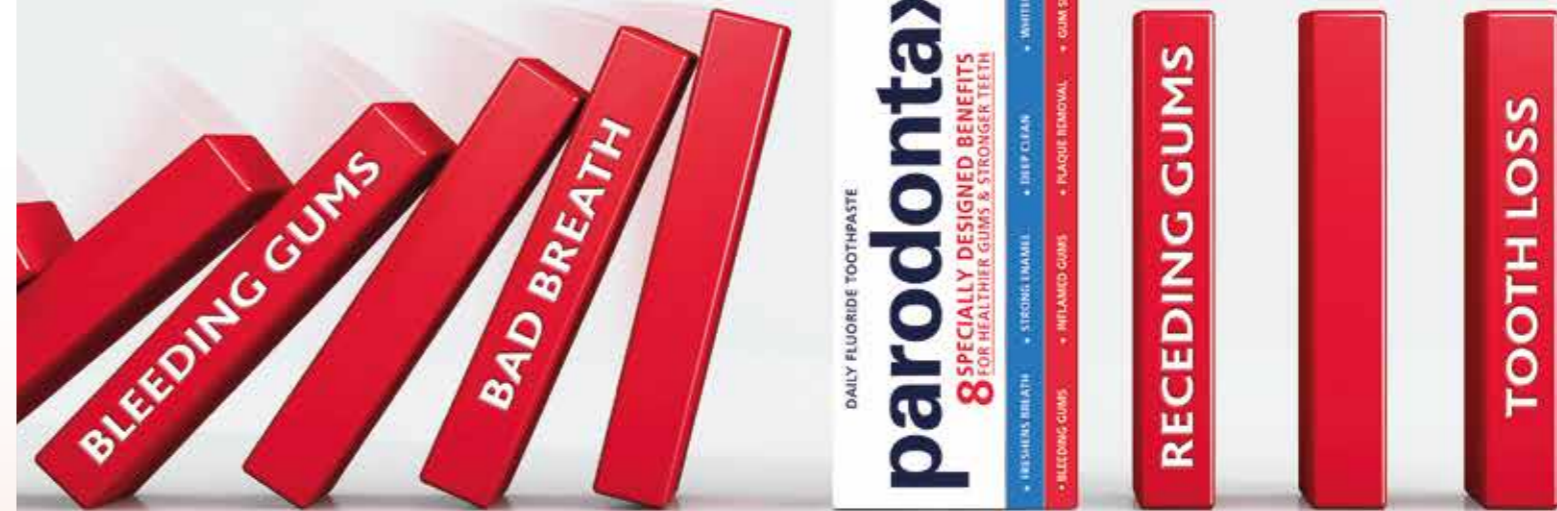
Accuracy of intraoral scans of edentulous jaws with different generations of intraoral scanners compared to laboratory scans
Kontis et al. 2021

DIRECT DIGITIZATION Trueness	INDIRECT DIGITIZATION Precision
INTRAOURAL SCANNERS	DESKTOP/LABORATORY SCANNERS
Superior than conventional methods for: • Single crowns • 3-unit-bridgework • Implant Dentistry • Improving accuracy in full arch cases	Best used as a bridge between functional analogue conventional impressions and digital workflow when mucocompressive techniques are required.
Inaccurate in complete edentulous cases due to: • Absence of distinct anatomical structures (Required in image overlay) • Large spans of non-attached mucosa	

Recap and Conclusions

- Optical impressions are not capable of:
 - Capturing soft tissues under compression.
 - Distinguishing attached mucosa from non-attached soft tissues
 - Can not determine the delineation of the peripheral seal for complete dentures
- Optical impressions are:
 - Higher in trueness than desktop scanners
 - Sensitive in image quality when comparing different scanning manoeuvres
- Optical impressions excel in capturing intaglio surface in a mucostatic state. Denture bases will rely on surface tension with mucosa and accurate anatomical seating for maximum retention. Current literature advocates the use of conventional methods of impression taking when mucocompressive impressions are required. Desktop scanners, being highly precise, can be used for the reproducible fabrication of multiple denture prostheses.

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IMPLEMENTING DIGITAL TECHNIQUES INTO THE DENTAL PRACTICE

By Dr John Micallef Stafrace MDS (Melit)



Digital dentistry is a rapidly growing field in the dental industry and is revolutionizing the way dentists provide care to their patients.

Dating back to 1984, when French dentist Dr. Francois Duret applied principles of CAD/CAM to aid in impression taking, the innovative approach combines technology and traditional dental practices to enhance patient care, speed up procedures, and improve overall outcomes.

In this article, we will explore the benefits of digital dentistry and how it can be implemented in the dental office.

THE BENEFITS OF DIGITAL DENTISTRY

Improved Accuracy: Digital dentistry uses advanced technology to create highly precise digital models of patients' teeth. This allows dentists to plan treatments with greater accuracy and improve patient outcomes.

Increased Efficiency: Digital dentistry enables dentists to complete procedures faster and with greater precision. Moreover, digital dentistry expands the dental team by managing to work with colleagues overseas with unique skill sets beneficial to your dental practice.

Enhanced Communication: Digital dentistry allows for easier communication between dentists,

technicians and also patients. Providing Digital mock ups for example could help negotiate patient expectations and communicate a treatment plan with greater ease.

Better Patient Experience: Digital dentistry provides patients with a more comfortable and efficient experience.

For example, digital impressions are much more comfortable for patients compared to traditional impressions which can be messy and uncomfortable.

Being up-to-date with current technologies would also brush off quite nicely with patients seeing their care-giver constantly updating themselves.

HOW TO IMPLEMENT DIGITAL DENTISTRY IN THE DENTAL OFFICE

Invest in the Right Equipment: The first step in implementing digital dentistry in the dental office is to invest in the right equipment. As more products are continuously being launched on the market, the cost of these products has dropped significantly making them more accessible.

Understand the equipment you need: There's no reason to splurge on an all-in-one system immediately. Understanding how to take a precise

digital impression is no easy task, and a large learning curve comes with it. Starting out with an intra-oral scanner is normally a great stepping stone into the world of digital dentistry.

Understanding the technology associated with designing restorations is another story, let alone setting up CAD/CAM milling systems in your dental practice.

Train Staff: Once the equipment is in place, it's important to train staff on how to use it properly. This includes not only the dentists but also the hygienists, assistants, and front office staff.

Develop a Workflow: Implementing digital dentistry may require changes to the current workflow in the office.

For example, it may be necessary to invest in new software to manage digital records and integrate with existing systems.

As mentioned previously, digital dentistry opens the door to a wide range of possibilities.

For example, working with technicians who might not be so available to you, or bringing in a second opinion from a peer colleague by simply sending a digital file over.

Continues on page 33.

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IMPLEMENTING DIGITAL TECHNIQUES INTO THE DENTAL PRACTICE

Continues from page 31.

THE ROLE OF ZIRKONZAHN IN ALL OF THIS

In 2003 Enrico Steger had a revolutionary idea: to develop a manual milling system that could be easily affordable for any dental technician.

So the manual zirconium milling machine based on the functioning principle of the pantograph was born. Thus, Zirkonzahn was born in Sud Tyrol, his home town.

Zirkonzahn offers a wide range of products and services to dentists, including digital tools for restorative dentistry, implantology, and aesthetic dentistry.

These tools include their CAD/CAM system, which allows for the precise and efficient fabrication of indirect restorations, fixed, removable prosthesis and many more.

In addition to their products, Zirkonzahn also provides comprehensive education and training programs to help dentists and dental technicians learn how to use their equipment and software effectively.

This includes in-person courses and workshops at their headquarters in Italy, as well as online training programs and certification courses. Ranger school and Military

school in Sud Tyrol are just a few examples. Zirkonzahn is a pioneer in digital dentistry education.

In conclusion, digital dentistry is transforming the way dental care is provided.

By investing in the right equipment, training staff, developing a workflow, and promoting the benefits, dental practices can successfully implement digital dentistry and improve patient care.

As technology continues to advance, digital dentistry will only become more prevalent and essential in the dental office. ■

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OSTEONECROSIS OF THE JAW AND MONOCLONAL ANTIBODIES

Summarised by Dr David Muscat from a lecture by Professor Andrew Borg

TAKE HOME MESSAGES

1. Osteoporosis can be fatal
2. ONJ is very rare
3. Bisphosphonates and biologics have been associated with ONJ
4. Mechanism is unclear
5. Consider a drug holiday

BIOLOGICS

Biologics are drugs whose active ingredient is created by biological processes in living cells.

Most modern biologics are rDNA proteins. These are large complex molecules with micro-heterogeneity and immunogenicity.

Their biologic structural complexity is compounded by complexity of the manufacturing process. The product is inextricably linked with the process.

A BIOLOGIC is a medicinal product with its active ingredient created by a biological process rather than by a chemical synthesis.

A biologic is most commonly a large molecule (protein) manufactured using recombinant DNA Technology

Other types may be obtained by extracting from a living system (eg whole blood and blood components, polyclonal antibodies).

BIOLOGICS PLAY AN IMPORTANT PART IN MEDICINE

They have reduced the treatment of many diseases such as cancer, diabetes, arthritis, hepatitis, anaemia, psoriasis, various conditions helped



by rhGH, inflammatory bowel disease, multiple sclerosis and end stage kidney, liver or heart disease. In rheumatoid arthritis and spondyloarthritis Biologics can induce and sustain remission.

Biologics have opened up targets for diseases e.g. rheumatoid arthritis Biologics are produced within living cells.

The biologic production process must have strict controls and monitoring as little changes may impact the product. The proteins are fragile and easily damaged and have a limited shelf life.

BIOSIMILARS

These are also known as follow-on biologic (USA) subsequent entry biologic (Canada), or similar biotherapeutic product (WHO).

IMMUNOGENICITY – TAKE HOME MESSAGES

Many biologics cause immune responses. Immune responses

can neutralize the biologic making it ineffective, or result in side effects that may be mild or serious, or have no impact at all.

IN CLINICAL PRACTICE

Substitution may complicate pharmacovigilance. Physicians should be able to identify and prescribe biosimilar products

OSTEOPOROSIS

This is decreased bone quantity and quality. It has an impact on morbidity and mortality. 50% of women and 20% of men over 50 will experience an osteoporotic fracture. A prior fracture is associated with a 86% increase risk of a subsequent fracture. Almost 25% of people over the age of 50 who suffer a hip fracture die within one year.

There is an increased incidence of osteoporotic fractures with age.

Continues on page 37.

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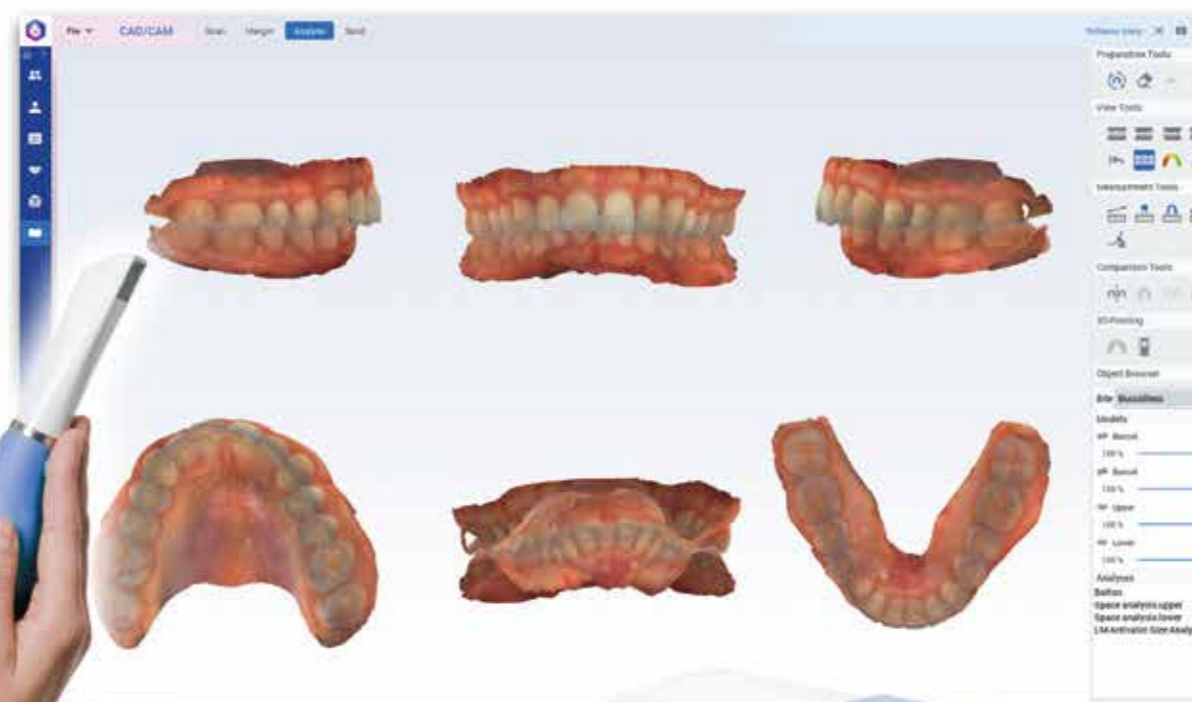


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OSTEONECROSIS OF THE JAW AND MONOCLONAL ANTIBODIES

Continues from page 34.

With osteoporosis there is a lack of adherence to treatment in chronic diseases and a poor adherence to prescribed doses. Patients are not compliant.

Full compliance is required for maximum fracture protection. Patients who are less than 50% compliant receive minimal or no fracture protection.

CONSEQUENCES OF HIP FRACTURE

- 20% Die within a year
- 50% Of those who survive are incapacitated
- 20% Require long term residential care

Recommendations include limited alcohol, no smoking, maintain active lifestyle and avoid falling over. Increase strength training.

THE DRUG HOLIDAY

This is a temporary not permanent suspension of active therapy. It is to be noted that even though the Bisphosphonates have been stopped there will be a persistence of the anti-resorptive effect for an undefined period of time. A drug holiday must be tailored to suit the individual.

BONE TURNOVER MARKERS

Suppression of these markers after discontinuation may give an insight into the persistence of the effect of the retained Bisphosphonate. If there is a significant increase in markers then it shows that the benefits of Bisphosphonate therapy are decreasing and one needs to return to active therapy.



for injectable bisphosphonates, denosumab and romosozumab.

Evidence shows that there is an increased risk with longer bisphosphonate use. Stopping bisphosphonates before dental work does not reduce the risk

Risk factors for ONJ include Cancer, chemotherapy, dental extractions, dental disease, dental trauma, poor OH, bacterial or fungal infection, alcohol, tobacco and diabetes

RETROSPECTIVE CHART REVIEW MDACC

In this study of 4019 patients ,3994 were included in the final analysis and 29 cases of ONJ were identified.

Overall 0.73%
Breast cancer 1.2%
Multiple myeloma 2.4%

The site of ONJ involvement was the mandible in 70% of case and the maxilla in 30% of cases. On 29 ONJ cases, 66% presented with exposed bone but no pain.

RISK FACTORS

- Extraction
- Periodontal disease
- Bone Exostosis
- Trauma: dentures, implants, intubation

COMPARED TO PATIENTS WITHOUT ONJ THE ONES WITH ONJ HAD

- A longer duration of disease
- A longer duration of follow up
- A longer duration of IV Bisphosphonates treatment
- A higher cumulative dose of IV Bisphosphonates

Continues on page 38.

BONE FORMATION

Involves osteocalcin or bone alkaline phosphatase

BONE RESORPTION

Involves serum collagen telopeptide C or N-Terminal (serum CTX or NTX)

OSTEONECROSIS OF THE JAW ONJ

This is a condition where there is delayed jaw healing. It results in unhealed areas inside the mouth and the underlying jaw bone which remains exposed for longer than expected. It may occur post extraction or due to an infection or idiopathic.

A diagnosis is made on clinical findings as well as radiographic findings.

ONJ rare with those on bisphosphonates with an incidence of 1 in 1000 and 1 in 10000 per year. The incidence is similar

OSTEONECROSIS OF THE JAW AND MONOCLONAL ANTIBODIES

Continues from page 37.

CONSERVATIVE MANAGEMENT

Antibiotics, oral rinses, good OH, and debridement of protruding bone.

None of the patients needed extensive surgery or developed severe infections or cutaneous fistulas.

In the MD Anderson Cancer Centre study, of 271 patients being treated for osteoporosis with IV Bisphosphonates, none developed ONJ.

GERMAN NATIONAL ONJ REGISTRY 2006 STUDY RIS

RECOMMENDATIONS FOR PATIENTS ABOUT TO INITIATE BISPSPHONATE THERAPY

Treat active oral infections. Teeth must be treated and epithelial healing must have taken place.

Preventative dentistry in patients with cancer, chemotherapy, steroids, or poor OH. The clinical judgement should be based on the individual benefit/risk assessment.

DENTAL MANAGEMENT OF PATIENTS TAKING BISPSPHONATES

Avoid invasive dental procedures. For those needing dental procedures no data to suggest that discontinuation of bisphosphonates reduces the risk of ONJ

FOR PATIENTS WITH ESTABLISHED DIAGNOSIS OF ONJ SMALL AREAS

Conservative treatment with antibiotics for 15 days plus chlorhexidine -irrigate necrotic bed.



A lecture was given by Professor Andrew Borg on Osteonecrosis of the jaw at The Prince of Wales Own Band Club Vittoriosa followed by dinner at Del Borgo sponsored by Pro Health.

LARGE AREAS

Plan surgery to remove necrotic base Consider suspension of bisphosphonates and also withdrawal of steroids.

DRUGS ASSOCIATED WITH MRONJ PRESCRIBED IN THE UK

- Bisphosphonates
- Allendroic acid
- Risedronate sodium
- Zoledronic acid
- Ibandronic acid
- Pamidronate disodium
- Sodium clodronate

- RANKL Inhibitor
- Denosumab
- Anti- Angiogenic
- Sunitinib

Untreated osteoporosis can be fatal.

ONJ is very rare.

Bisphosphonates and Biologics have been associated with ONJ.

Mechanism is unclear. Osteonecrosis of the jaw is very rare in people taking drugs for osteoporosis. The benefits often outweigh the risk. 🦷

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