Titanium implants may carry risk of corrosion, study finds

Study links bisphosphonates to osteonecrosis of the jaw

Cumulative incidence of ONJ significantly higher among patients who had received BP

KYOTO, Japan: A new study has shown that bisphosphonates (BP), a class of drugs commonly used to treat bone diseases such as osteoporosis, is associated with an increased risk of developing severe bone disease of the maxilla and the mandible. The researchers found that especially elderly patients who had received intravenous BP had an increased risk of osteonecrosis of the jaw (ONJ).

The study was conducted among 3,216 male and female patients aged 20 or older mostly diagnosed with osteoporosis and various types of cancer. They had undergone tooth extraction at the Kyoto University Hospital’s Department of Oral and Maxillofacial Surgery between April 2006 and June 2009. About 4 per cent (126) had received either oral BP (99) or intravenous BP (27), while 96 per cent (3,090) had not received such treatment.

Researchers from the institute found that at 42 months following tooth extraction the cumulative incidence of ONJ was significantly higher among patients who had received BP. According to the study, five patients to whom BP had been administered developed ONJ, compared with only one patient in the control group.

They observed a significant difference with regard to age and prevalence of cancer or osteoporosis between the two groups. The risk ratio for ONJ was particularly elevated in patients aged over 65 who had received intravenous BP, according to the researchers.

In addition, they found that alveolar bone loss could be a risk factor for BP-induced ONJ after tooth extraction. Thus, they suggested that inflammation of the periodontal tissue might predispose people to the condition, and preventive treatment of oral bacteria might be essential for a favourable outcome of tooth extraction.

BP is usually administered to prevent further bone loss, reduce pain and increase bone mineral density in patients with bone disorders. A study published in the September 2003 issue of the International Journal of Oral and Maxillofacial Surgery was the first to suggest osteonecrosis as a side effect of bisphosphonate treatment. In the current literature, the estimated incidence of BP-induced ONJ ranges from 8.3 per cent to 40 per cent.

BIRMINGHAM, UK: Titanium medical implants used in dental prostheses and bone-anchored hearing aids may be less robust than commonly believed. Researchers from the UK and University of Birmingham’s School of Dentistry and his team obtained tissue samples and bone-anchored hearing aids (BAHA) implants used in dental prosthetics and bone-anchored hearing aids (BAHA) were examined using micro-focus synchrotron X-ray spectroscopy at the Diamond Light Source, Oxford, UK.

“The results showed, for the first time, a scattered and heterogeneous distribution of titanium in inflamed tissue taken from around failing skin-penetrating titanium implants,” the authors reported. “Wear processes and implant debris were unlikely to be major contributors to the problem. In the absence of obvious macroscopic wear or loading processes, we propose that the titanium in the tissue results from micro-motion and localised corrosion in surface crevices.”

Globally, more than 1,000 tonnes of titanium are implanted into patients in the form of biomedical devices every year. Metallic prostheses, fixation and anchoring devices are used extensively for dental, orthopaedic, and craniofacial rehabilitation and their effects on the body are well perceived to enable predictable following initial implantation.

The development of peri-implant inflammation may result in the premature loss of the implant device or the requirement for revision/rescue surgery, which are scenarios that can be long-term, carrying an impact on patients’ well-being and economically on the health service provider,” the authors concluded in the study. “Our results emphasise the need to understand further both the physical and chemical mechanisms leading to the dispersal of titanium species in tissue around implants and their potential to exacerbate inflammation.”

Addison commented that while the findings pose no alarm to those with BAHA implants or similar devices, they demonstrate that improvements in materials like titanium can be sought. Research is currently being conducted to look at the biological consequences and to understand the mechanisms by which the debris is produced.
HELP YOUR PATIENTS
ROOT OUT THE PAIN.
Endodontic retreatment

Achieving success the second time around

The presence of pretreatment apical periodontitis is one factor that has been shown to decrease the success rate. Without apical periodontitis, a ten-year success rate of 92% to 98% has been shown for both initial and retreatment root-canal therapy. With the preparatory presence of apical periodontitis, there is a decrease in the success rate from 74% to 86% over the ten years. From this, it is evident that endodontic healing is attainable through retreatment procedures, allowing us to maintain our patients’ natural teeth (Figs 1a–c). Although the alternative clinical treatment option of implant placement can provide an effective method for replacing a missing tooth, healthy maintenance of the natural tooth should remain the overall goal.

Post-treatment disease is, inevitably, a result of bacteria and the host response to the patient to the bacteria. These microorganisms are the most critical aetiology of post-treatment disease, as they are present within the root-canal system of a previously endodontically treated tooth owing to a combination of substandard endodontic techniques, iatrogenic treatment issues and restorative failure.

Intra-radicular bacteria are the primary aetiology of post-treatment disease and eradication of these bacteria is the primary goal of retreatment procedures. The intra-radicular bacteria present in the previously treated teeth are persistent and resist methods. Bacteria are able to hide and survive in canal ramifications, deltas, irregularities (tins) and dentinal tubules. In essence, it was demonstrated that non-surgical retreatment had a success rate of 83% versus 71.8% for endodontic surgery after four to six years.

The bacteria present in the initial root canal system preoperatively (green areas) and the minimal amount of canal-wall-cleansing that was accomplished during canal instrumentation (red areas) are illustrated. The remaining green areas illustrate the space that might be left untreated, thereby providing a source of bacteria and supporting substrate for intra-canal infection. The potential substrates that are found inside the canal and help the bacteria survive can include untreated pulp tissue, the presence of a biofilm and tissue fluid. This may be present in the canal owing to a poor coronal or cervical seal and microbial proliferation. The presence of a poor seal, bacteria and substrate for their growth results in ideal conditions for persistent inflammation and disease.

The bacteria present in the initial infection of a root canal differ markedly from the bacteria infecting a previously treated tooth. Pulp tissue is polymicrobial with equal numbers of Gram-negative and -positive bacteria. Post-treatment bacteria may be predominantly Gram-positive and they have been shown to be able to survive in harsh environments and to be resistant to many treatment methods.

There are high numbers of Enterococcus species. Enterococcus faecalis, for example, has been shown to be a common isolate in 27% to 77% of teeth with post-treatment disease. A contaminated canal space may result from incomplete cleansing initially or subsequent leakage into root-canal spaces following root-canal treatment. Once present inside the canals, E. faecalis has a variety of characteristics that allow it to evade our best efforts to eradicate it from the root-canal system, including the ability to invade dentin tubules and adhere to collagen. It is also resistant to calcium hydroxide application inside the canal system, which is an interappointment treatment technique used to help remove microorganisms and their by-products, such as lipopolysaccharides, from the canal space. E. faecalis’s resistance to calcium hydroxide action arises from its ability to pump hydrogen ions from a proton pump. The hydrogen combi-nes with the hydroxyl ions of calcium hydroxide and neutralises the high pH value.

E. faecalis is also able to resist calcium hydroxide by being part of a biofilm. The protection of bacteria within a biofilm matrix prevents the contact of the bacteria with irrigants and medicaments, and allows communication between bacteria to aid in survival capabilities. The presence of E. faecalis is well-documented, however, its role in post-treatment disease has yet to be proven definitively. Its survival mechanisms, however, shine a light on the persistent capabilities of these bacteria, and our clinical techniques must be focused on the challenge of eliminating them.

Iatrogenic issues encountered during the initial root-canal treatment may be the cause of intra-canal bacterial infection. These issues may include transportation, over-instrumentation, shaping, inadequate canal enlargement, missed canals, lodging, canal transportation, over-instrumentation, and shaping, inadequate canal enlargement, and cleaning. Inadequate canal enlargement, and cleaning, inadequate canal enlargement, and cleaning.

Full-strength 6% sodium hypochlorite has been shown to be highly antimicrobial and able to dissolve tissue and disrupt bacterial biofilms. These qualities in an irrigant are ideal for the debulking of residual bacte-ria and tissue debris. The use of a rubber dam to isolate the treatment field is the standard of care for endodontic treatment. Failure to use a rubber dam to isolate the treatment field is the standard of care for endodontic treatment. Fig 1a: Tooth 49 shows a radiolucent periradicular lesion around the mesial root apex and into the foramina.—Fig. 1b: Post-op radiograph.—Fig. 1c: One-year follow-up radiograph. (Courtesy of Dr Brett E. Gilbert)——Fig. 2: The unprepared pulp tissue (green) and the post-op prepared or instrumented areas (red), showing the complexity of the root-canal anatomy and the difficulty in completely cleaning the root-canal system. (Courtesy of rootcanalanatomy.blogspot.com)
Restorative failure is a common cause of post-treatment disease. The following case illustrates the ability to overcome coronal leakage on a crowned tooth can also allow bacterial entry to occur. Decay in a previously treated tooth is another source of bacterial contamination. Structural damage to a tooth by trauma, cracking or fracture may provide an entry point for bacterial contamination of the canals. Our patients are responsible for their own oral health and must commit to effective oral hygiene techniques. Failure of the patient to perform effective oral hygiene can result in the failure of the root-canal system completely. The following clinical case illustrates the extent of the canal space left untreated in the initial root-canal therapy by not opening the mesiobuccal canal adequately and not locating and cleansing the hidden second mesiobuccal canal.

Endodontic ultrasonic tips are highly efficient at removing core build-up material, paste fills, posts and silver-point fillings, as demonstrated in Figure 5. These instruments allow clinicians to conserve root dentine by providing excellent visibility under a dental operating microscope, thereby greatly improving the ability to retreat canals (Figs 6a–c). A heat source such as a System B tip (Axic, SybronEndo) is efficient for the removal of gutta-percha and resin materials from the coronal third. Hand and rotary files can remove root fillings and shape canals to appropriate working lengths. Current NiTi rotary files are highly flexible and resistant to separation that we can retreat previously endodontically treated and shaped canal spaces. The warm vertical condensation technique using gutta-percha or resin and an appropriate sealing agent provides a thorough seal of the well-cleansed and shaped canal spaces. The final restoration must provide a proper seal of the pulp chamber to prevent coronal micro-leakage.

Current evidence has demonstrated that we can retreat previously endodontically treated teeth properly and successfully. The literature has also shown that specific bacteria, such as E. faecalis, are able to survive inside the canal.25 Current evidence has demonstrated that specific bacterial infection of even the most well-executed root-canal treatment ma  terials increases our ability to attain healing after retreatment. The irrigant solutions target the bacteria we are trying to eliminate. While sodium hypochlorite is the primary option for patients with post-treatment disease, the use of a dental operating microscope, ultrasonic instruments, irrigants, rotary NiTi files and appropriate obturation materials increases our ability to attain healing after retreatment.

Once debridement and disinfection have been completed, appropriate obturation methods are used to seal the canal spaces. The warm vertical technique using gutta-percha or resin with an appropriate sealing agent provides a thorough seal of the well-cleansed and shaped canal spaces. The final restoration must provide a proper seal of the pulp chamber to prevent coronal micro-leakage.

A complete list of references is available from the publisher.
Silane coupling agents and surface conditioning in dentistry

Dr. Christine Ying Kei Lung, Jukka Pekka Maatulma

In dental restorations, it is desirable to have durable and strong bonding between resin composite and dental restorative materials. Weak bonding at the interface can be dramatically enhanced with a coupling agent.

Silane coupling agents, which are synthetic hybrid inorganic-organic compounds, are used to promote adhesion between dissimilar materials. They are good at promoting adhesion in silica-based materials such as porcelain, and cannot be used for adhesion. Two-lane solution is relatively short. The shelf life for a single-bottle solution is 3-methacryloxypropyltrimethoxysilane. This is pre-hydrolysed in a solvent mixture usually consisting of ethanol and water that is acidiﬁed with acetic acid.

This review will discuss surface-conditioning methods and some new surface-conditioning techniques, silane chemistry, silane application in dentistry, and the limitations of silanes in adhesion promotion.

The silane monomer most commonly used in clinical commercial products is 3-methacryloxypropyltrimethoxysilane. This is pre-hydrolysed in a solvent mixture usually consisting of ethanol and water that is acidiﬁed with acetic acid.

The shelf life for a single-bottle silane solution is relatively short. The solution will turn cloudy over time and cannot be used for adhesion. Two-bottle silane systems have been developed to offer a more stable system. One bottle contains an undehydrated silane in ethanolic and the other contains an aqueous acetic acid solution. The two solutions are mixed for silane hydrolysis before use.

Surface-conditioning methods

The surface conditioning of restorative materials is an important preliminary step in clinical practice to modify surface properties for durable and hydrophobically stable adhesion. The surface pretreatment methods widely used in dental technology are grit blasting, tribochemical silica coating and hydrolytic acidic etching, which will be discussed brieﬂy in the following section.

Grit blasting

The surface of materials such as metals, alloys and some ceramics is sand-blasted with alumina particles of 110 µm in size at a perpendicular distance of 10 mm under an air pressure of 380 kPa for ten to 15 seconds. This process is intended to increase the surface roughness of the materials. It also enhances micromechanical retention for bonding.1

Pyrochemical silica coating

Over the years, silica-coating systems have been used in dental laboratories. Brieﬂy, they are Silicoter Classic, Silicoter MD and Silico (All Helius Kuteri) and PyrosilPen (SURA Instruments).2 In these systems, a tetraethoxysilane solution is injected into a flame and burned with butane in oxygen. The silane decomposes and forms reactive Si-O-C fragments, which are deposited on the substrate surface. A glass-like silica layer is thereby formed on the surface.3 The use of this surface treatment is not popular in clinical practice.

Tribochemical silica coating

The tribochemical Rocatec system (SM ESPE) that uses silica-coated alumina particles was introduced in 1989. It is indicated for silica coating of ceramic and metal surfaces.4 It enhances the adhesion of a silane coupling agent to a silica-coated material by forming a durable siloxane Si-O-Si bond. This surface treatment also increases the surface roughness that provides micromechanical retention for resin bonding, that is, for the resin to penetrate pores on the surface.5,6

Hydrolytic acidic etching

Hydrolytic acidic etching is normally used to etch porcelain veneers and for intra-oral repair of fractured porcelain restorations before cementation.1 Low concentrations of 4 to 10 % hydroﬂuoric acid are used in clinical practice. When a porcelain surface is etched with hydroﬂuoric acid etching gel, the acid dissolves the glassy matrix of the porcelain. A microscopically porous and micro-retentive surface is then produced and micromechanical interlocking for resin bonding is enhanced.7

New surface-conditioning methods

The quest for enhanced and durable bonding continues. Several new surface-conditioning methods are currently under investigation globally. These include laser surface treatment,8 selective infiltration etching,9 nanostructured alumina coating8,9 and plasma treatment.10

Laser surface treatment

Laser stands for light ampliﬁcation by stimulated emission of radiation and the technology was introduced in the 1950s. Er:YAG, ND:YAG, and CO2 lasers are used in dentistry for soft-tissue surgery and hard-tissue treatment and surface treatment.11,12 Laser irradiation of a ceramic surface produces irregularities on the surface, which increase the surface roughness for mechanical retention.13 The main problem, however, of this surface treatment method is the formation of surface cracks owing to thermal effects of laser irradiation at high power settings.14,15 Therefore, appropriate laser settings for different ceramic surfaces is important to prevent formation of surface cracks.

Selective laser etching

In this method, a thin layer of a glass conditioning agent is coated on to the zirconia surface and is then heated to above the glass transition temperature. The molten glass particles may infiltrate between the surface grains. After this process, the specimens are allowed to cool at room temperature. The conditioning agent is then removed by applying hydroﬂuoric acid and rinsing it off. This creates a new retentive surface for resin-zirconia bonding.16

Nanostructured alumina coating

In this coating method, the zirconia is immersed in a suspension of aluminium nitride. Aluminium nitride undergoes hydrolysis to form boehmite, which is deposited on to the zirconia surface. A heat treatment at 900°C is carried out. Boehmite undergoes a phase transition to d-alumina. Through this treatment, a micro-retenive surface area is created that may increase mechanical interlocking for resin bonding.17

Internal coating with porcelain

The zirconia surface is sand-blasted with alumina particles of 70 µm in size. Then, the surface is coated with high fusing porcelain which is prepared by stirring the porcelain powder into an excess amount of di-stilled water. The porcelain is fired at a high temperature. After the fusing process, the surface is sand blasted again. A silica-containing layer forms on the zirconia surface. This enhances adhesion with a silane coupling agent, that is, siloxane linkage formation.18

Chemical vapour deposition

In a chemical vapour deposition system, the zirconia surface is exposed to sulphur hexaﬂuoride plasma. An oxygen ﬂux is formed on the surface. This layer may increase the reactivity of zirconia towards a silane coupling agent. However, the exact mechanism of the bonding formation between the zirconium oxyﬂuoride layer with silane is still unclear.19

Silane chemistry

Functional and non-functional silanes

Functional silanes contain two different functional groups that can react with inorganic matrices, for example ceramics, and organic materials, for example resins. Therefore, they can be used as coupling agents to connect dissimilar materials.

There is also a group of silanes called the non-functional silanes. They contain one reactive functional group that can react with inorganic matrices. They are widely used for some speciﬁc surface modification of materials. In addition, there is a bi-functional/cross-linking/dipodal silanes that possesses two silicon atoms with three hydrophilic/alkoxy groups. Cross-linking silanes are used in the steel and tyre industries.20 Such silane is also incorporated with functional silane to increase the bonding and hydrophobic stability of resin composite to titanium.21

Silane activation mechanism

Silanes can create a bond between inorganic and organic materials. A typical functional silane coupling agent is Z-(CH2)nSi(OR)3 where n is a linker group, and OR is an alkoxy group. The alkoxy groups...
are activated by hydrolysis ([SiOR] before they react with the surface hydroxyl groups of the substrate.28

The first step of silane hydrolysis is the fast and reversible protonation of the alkoxyl group at a low pH (3–5). Next, a bimolecular nucleophilic substitution (SN) reaction at the silicon atom takes place. A nucleophile, a molecule or a small fragment of the configuration.28 A suggested mechanism for silane hydrolysis is shown in Figure 1.

The silane hydrolysis rate depends on the steric (size) and inductive (electronic) effects of alkoxyl groups on the silane. The steric effect is the dominant factor that affects the silane hydrolysis rate.28 This effect is best illustrated using a ball-and-stick model (Fig. 2).

As shown in Figure 2, the steric repulsion increases when the size of the alkoxyl group is changed from a methoxy to a butoxy group. The approach of a water molecule, a nucleophile, to the silicon atom is more difficult for the bulky butoxy groups. This may explain why ethoxylsilanes are employed in commercial dental products because of fast hydrolysis of small ethoxy groups. Methoxysilanes are not used, as the by-product methanol is very toxic.

The organo-functional groups of silane coupling agents consist of, for example, >C=O, a vinyl double bond that can react with the functional groups of resin composite consisting of >C=O bonds. The reaction is initiated by the initiators in the resin composite, which are decomposed by visible light to form free radicals. These free radicals react with the >C=O bond in the resin composite or in the silane molecule to generate another free radical species. The reaction of these free radicals with resin composite monomers or in the silane molecule forms new C-C single bonds. Therefore, the silane coupling agents connect the resin composite and the inorganic substrate surface.29

Application of silanes in dentistry

Ceramic restorations and repairs

Silane coupling agents are used in dental restoration, such as ceramic repairs of onlays, inlays, crowns and bridges. For most patients, repair is more economical and time-saving than the fabrication of new restorations, unless damage due to fracture is beyond repair. The clinical procedure for repairing ceramic restoration usually involves the following steps: roughening the surface with diamond burs, sand-blasting the surface, acid etching, silanisation and finally bonding to resin composite.29

Glass fibre-reinforced composites

A relatively new group of dental biomaterials, the glass fibre-reinforced composites, is used in fixed partial dentures, removable prosthodontics, periodontal splints and retention splints.30 The adhesion between the glass fibre and resin composite is improved by adding a silane coupling agent. The silane forms siloxane linkages with the surface hydroxyl groups of glass fibre. The organo-functional groups of silane react with the functional group in the resin composite. Thus, the bonding strength is increased between resin composite and glass fibre.31

Resin composite filling materials

Nowadays, dental resin composites are composed of a resin matrix that contains monomers and cross-linking monomers, as well as a free-radical initiator, an inhibitor, colouring pigments, filler materials such as barium glass, silica, apatite and silicon dioxide. The resin matrix enhances the bonding between the filler particles and the resin matrix.32 The filler particles added to the resin matrix also improve the physical and mechanical properties of the resin composite. Moreover, the addition of fillers reduces volume shrinkage after polymerisation, and improves the aesthetic appearance and radiopacity.33

Titanium, noble metal and base metal alloys

Titanium, noble metals and cobalt-chromium (base metal) alloys are commonly used for removable partial and complete dentures with a metal frame incorporated and metal-resin cement restoration.33–35 For these metal and metal alloys, surface conditioning by sand-blasting using silicate-coated alumina particles produces a silico-coated layer on the surface. Application of a silane coupling agent to the silico-coated surfaces forms a durable siloxane linkage. This is followed by cementation.

Limitations of silanes as adhesion promoters

Silanes are good at promoting adhesion between resin composites and dental restorative materials but there are some limitations to silane coupling agents.

The adhesion of silane coupling agents and non-silica-based restorative materials such as alumina, zirconia or metals is weaker than the silica coating of these materials.35,36 Therefore, a surface pretreatment with silica coating is required so that durable bonds (siloxane bonds) are formed between silane and silica-coated restorative materials. For noble metals or noble metal alloys, thione or thiol-functional coupling agents are used to promote adhesion.37 These coupling agents have different bonding mechanisms with various dental restorative materials.

Current trends and future development of coupling agents in dentistry

Nowadays, other coupling agents such as phosphate ester are used to self-adhesive resin cements and adhesive primers, metal and alloy primers, and carboxylic acid primers used in dental restoration.37–39 Phosphate ester can bond directly to non-silica-based ceramics such as zirconia.39 It has been reported that using this phosphate ester can enhance the hydrolytic stability of bonding more than using silane coupling agents can.39

The main problem of resin composites bonded to silica-coated restorative materials with the application of commercial silane coupling agents is the bond degradation over time under artificial aging.40 In order to increase the hydrolytic stability of the bonding at the interfacial layer, novel silane-based coupling materials and the design of novel silane monomers can solve this problem. Silane coupling agents with long hydrocarbon chains are more hydrophobic than those with short hydrocarbon chains. The bonding at the interfacial layer is more resistance to water ageing. These two approaches could resolve the problem.

It could be said that silane coupling agents can fulfil the clinical requirements for dental restorations. Nowadays, a standard laboratory protocol for dental restorations entails surface conditioning of dental materials, silanisation and cementation. The problem of hydrolytic stability of the siloxane linkage formed from silane coupling agents with resin composites and dental restorative materials is currently being addressed. It is not an exaggeration to claim that silane coupling agents have wide application in industry, dentistry and medicine and will play an important role in biomaterials science.

This review is based on the article “Aspects of silane coupling agents and surface conditioning in dentistry. An overview” Dental Materials, 26 (2010), 467–77. A complete list of references is available from the publisher.

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Extending the boundaries of feasibility in direct restorative procedures

A clinical case combining a high-performance material and clearly defined protocol

Owing to the fact that approximately half of the original tooth structure had been lost, we opted for a direct composite restoration, provided that a tooth-whitening procedure could be successfully completed. Along the spectrum of possible treatments, this approach is located between “conventional” composite restoration and ceramic veneering and, therefore, appeared to be clinically appropriate.

The patient, whose primary concern were a natural tooth shade and minimal loss of tooth structure, agreed to the recommended procedure. We decided to use the nano-hybrid composite IPS Empress Direct (Ivoclar Vivadent) to fabricate the restoration. In addition to dentine and enamel materials, this product is also available in an opalescent material version.

Preliminary treatment

First, internal bleaching was performed on the tooth, on which the success of treatment would depend. Access to the endodontic chamber was created through the old restoration. The gutta-percha increment was removed up to 3 mm below the cemento-dentinal junction. At the bottom of the cavity, a plug with a thickness of 2 mm made of glass ionomer cement was inserted to prevent the bleeding agent from accessing the sensitive areas. We used a mixture of sodium perborate and distilled water for the bleaching procedure. The access to the cavity was then sealed with a temporary material.

Since the desired tooth shade was not achieved upon initial bleaching, the entire procedure had to be repeated after one week. After another week, the result was finally optimal (Fig. 3). In order to neutralise the bleaching agent, calcium hydroxide was placed into the cavity and left in place for at least one week. (An adhesive may only be applied 15 days after conclusion of the bleaching procedure, in order to ensure optimum adhesion and stable shade.)

Aesthetic diagnosis and shade determination

After tooth-shape analysis, we concluded that the proportions were harmonious compared with tooth #21. In order to avoid a misinterpretation of the shade owing to dry adjacent teeth, the tooth shade was determined prior to any intervention and in daylight. The IPS Empress Direct shade guide was used for the determination of the enamel and dentine materials. We determined the dentine shade based on the cervical third and the enamel material based on the incisal third of the adjacent tooth. Particular attention was paid to the anatomical structure of the adjacent tooth and the various opalescent reflections visible on the incisal surface, since it was our aim to imitate these features. A layering diagram detailing all the materials that we planned to use was prepared. In this case, only four shades were used: A3/A2 Dentin, A2 Enamel and Trans Opal.

Subsequently, we created a palatal silicone key on tooth #11 with the appropriate shape and occlusion. Once in place intra-orally, this key helped to create the palatal wall of the restoration in one step. The key included the teeth adjacent to the tooth that needed to be restored and covered the incisal area.

Preparation and application of the adhesive

The existing restoration was removed with the help of both rotary and ultrasonic instruments and with care to prevent any damage to the adjacent teeth. During the preparation of the tooth, the mechanical properties of the material used and the aesthetic integration needed to be taken into account. In the case of IPS Empress Direct, the ideal preparation design involved a vestibular chamfer and a straight, right-angle proximal and palatal margin (Fig. 4).

Before proceeding with the adhesive cementation, it was necessary to protect the operatory field from saliva or blood in the oral cavity. Therefore, we isolated the anterior teeth, including the canines, with a rubber dam. The expanded treatment area allowed us to assess the incisal line, and the size and shape of the adjacent teeth.
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We checked whether the silicone key could be positioned exactly. (If required, interfering areas can be adjusted using a scalpel until a precise fit is achieved.) The enamel areas were etched for 30 seconds and the dentine for 15 seconds. Both were then thoroughly rinsed and dried.

Subsequently, the adhesive was applied, while the adjacent teeth were protected with a metal matrix. We used the Excite F total-etch adhesive (Ivoclar Vivadent) for this step. Owing to the non-retentive preparation design and the fact that most of the restoration would be created on enamel, this type of adhesive proved superior to self-etching products. In order to facilitate penetration into the dentine tubules, the adhesive was gently massaged into the cavity walls. (After the adhesive has dried, the cavity must exhibit a glossy appearance. If this is not the case, the procedure needs to be repeated.)

The adhesive was then light-cured for 10 seconds with a bluephase curing light (Ivoclar Vivadent).

Building up the palatal and proximal walls
As a first step, the palatal enamel was built up. A thin layer of enamel material (shade A2) of less than 0.5 mm was applied to the palatal key and smoothed out with a brush. Then the key loaded with composite material was placed in the mouth and the fit was checked again. If necessary, the material may be modified before it is polymerised for 10 seconds.

The palatal wall created in the process showed the exact desired shade and did not touch the adjacent teeth (Fig. 5).

Applying a thin layer of enamel material (A2) to the proximal walls changed the complex cavity into a simple one. In order to create the thin layer, we fixed a transparent matrix in place with a wooden wedge, which allowed us to create the transition lines of the convex area that separates the proximal from the vestibular area—

the restorative outcome is influenced by the successful design of these transitional areas because it is not possible to design them with rotary instruments. We then applied composite material from the distal side of tooth #11, while tightening the matrix from the opposite side and polymerising the material in this position (Fig. 6).

Thus, sufficient composite material could be added until the desired transitional area was achieved. The mesial side was built up in the same manner (Fig. 7).

Building up the dentine core
Using dentine materials, a restoration is created that shows decreasing saturation from the cervical to the incisal and from the palatal to the vestibular area. In order to achieve this, a 3D layering technique is applied, using materials with different levels of saturation. In our case, a material with a saturation one degree higher than the desired final tooth shade was applied. Therefore material in shade A3 was used in the area of the cervical margin.

The layer was applied to the palatal wall using a flat spatula suitable for composite resins (Fig. 8). Subsequently, a layer consisting of dentine material with a lower saturation was applied (shade A2). A pointed silicocine instrument was used to design a slightly wary margin covering half of the chamfer up to 1 mm below the incisal edge (Fig. 9). (If this technique is applied, the translucency of the enamel material becomes visible in the area of the incisal edge and the transition from tooth structure to composite material is masked.)

Each layer was polymerised with the bluephase curing light for ten seconds.

Designing the enamel portion
The opalescence effect was enhanced by applying a thin layer of Trans Opal material in the area of the incisal edge. Since the visible effect of this material is very intense, only a small amount could be used. An enamel layer (shade A2) was applied in several steps to the vestibular area, then contoured with brushes and ca-

red for ten seconds. This enamel material covered the entire restoration (Fig. 10).

Finishing and polishing
The patient’s teeth exhibited a very pronounced macro- and microtexture (vertical pits and horizontal streaks, respectively). Imitating these features to achieve a lifelike reflection on the restorative surfaces was a challenging task.

This step was similar to determining the appropriate shade. We imitated the surface texture with fine-grain diamond-coated burs, using flame- and lens-shaped instruments (first with the red and then with the yellow colour code). The burs were used in the red handle without water irrigation.

Another important step was the finishing of the transition lines and the interproximal areas. It is advisable to use abrasive strips for this purpose because rotary instruments may produce flat areas that cause inappropriate reflections. OptiPol Next Generation polishers (Ivoclar Vivadent) with water irrigation were used for the polishing process. We always take great care to polish restorations perfectly whilst avoiding any damage to the surface texture we design. The polishing was greatly facilitated as a result of the extraordinary polishability of this composite material (Figs. 11 & 12).

Conclusion
Owing to high-performance materials such as IPS Empress Direct, which are constantly improving, and a clearly defined approach, we may use direct restorations for more indications than ever before, thus constantly extending the boundaries of feasibility. The advantage of direct restoration procedures is that they are time saving and conservative. Nevertheless, it may happen that directly restored teeth show discoloration again in spite of the perfect aesthetic outcome. In this case, another treatment is inevitable.

Triumvirate to lead medical tourism
NOIDA, India, & ROSWELL, Ga, USA: The increase in medical tourism in Asia will apparently only benefit certain countries in the region. According to a report released by India-US market research provider Renub Research, over two thirds of the market for foreign medical and dental services will be controlled by India, Thailand and Singapore in the near future.

Overall, Renub estimates that the number of arrivals for medical and dental tourists will exceed ten million by 2015, which would be a 50 per cent increase from the present volume. Thailand, which currently sees the largest number of foreign medical tourists per year, is predicted to double its market volume within the next three years. The country currently holds the largest market share with 40 per cent.

It will be followed by Singapore, with an estimated one million arrivals per year and India with an expected half a million arrivals. Together, all three markets will hold a total share of 80 per cent while countries like South Korea, the Philippines, Malaysia and Taiwan will compete for the remaining 20 per cent. Taiwan in particular is expected to be frequented by members of the Chinese middle class who can increasingly afford high-cost medical and dental treatment. Other countries were not included in the report.

With rates of up to 30 per cent, medical tourism has been one of the fastest growing business sectors in the region owing primarily to the rising affluence of the middle class and a boom in the private health care sector. Recognising the potential, several countries have recently started initiatives to improve medical facilities and the workforce, as well as to attract more patients from abroad.

Europe closer to amalgam ban
A new study, conducted on behalf of the European Commission, has recommended phasing out dental amalgam use over the next few years owing to mercury’s negative impact on the environment. The decision to effect a ban would probably be made in 2013, and become applicable five years later, the authors suggested.
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“I wanted to create a whole new experience of toothbrushing”

An interview with designer Shirin Fani, Iran, about the Tooth Hero

Children usually don’t like brushing their teeth. However, a new oral hygiene set, called the Tooth Hero, will encourage children to do so in a playful and interactive way. Shirin Fani, an international student design competition winner, came up with this idea in her diploma project. For her, it was always a dream to create a real product out of her idea and convert it into a real product. She is particularly excited about the Tooth Hero and is planning to approach some companies for industrial design in Austria. DT In the meantime, winning the award was a great deal.

Did you consult dental and educational staff for advice on designing the device?
Yes, of course. I read a lot and talked to dentists and parents about the Tooth Hero concept. I even accompanied some children to their dentist. I showed a number of dentists the prototype and discussed the project and its approach with them.

How has your project been received so far?
The brush set was tested by children from the start of the project. I received feedback from children throughout, from the very first idea of the product until the final prototype. For them, using the Tooth Hero meant winning a game, which they loved. The device gives children the opportunity to be the heroes of their teeth by fighting the bacteria that live in their mouth. In this manner, brushing rules can be taught; for instance, high brushing pressure can result in losing points in the game.

What are your plans now? Are you going to develop more dental design products and market your idea?
I found it fun to design for children. Winning the award was a step towards converting my concept into a real product. I haven’t introduced the project to any companies yet because I only finished the project at the end of June, but I’m planning to approach some companies because I absolutely believe in this project and its potential to be a real product and new trend in oral care for children.

Surgical factors that influence the aesthetic treatment outcome

Dental implants provide a predictable means for replacing missing teeth. Increasingly, the demand for implant treatment involves not only the restoration of function, but also achievement of an aesthetically pleasing prosthesis that blends imperceptibly with the rest of the natural dentition.

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Both surgical and restorative factors contribute and interact to achieve an aesthetic treatment outcome. Surgically, the clinician is mainly able to influence the hard and soft-tissue architecture of the edentulous space, which in turn provides the soft-tissue frame for the prosthetic reconstruction.

A detailed evaluation of the site is required as a first step. Sites that are compromised by loss of bone and soft-tissue height may be difficult or impossible to reconstruct to the original pristine form. Limitations of treatment and the risk of adverse aesthetic outcomes need to be recognised, and communicated to the patient before the commencement of treatment.

A number of surgical factors are under the control of the clinician. Positioning the implant in the correct restorative position is a critical determinant of aesthetic outcome. Malpositioned implants may be associated with adverse soft-tissue outcomes, including loss of papilla and recession of the midfacial mucosa.

Facial malposition can be a risk with immediate implants placed into extraction sockets. When multiple adjacent teeth need replacement with implants, the relative position, dimensions and number of implants are important surgical considerations. Adjacent implants if placed too close together risk loss of the bone between the implants, which in turn may cause flattening or a crater between the papilla. This can have very negative aesthetic implications.

As a general rule, adjacent implants should be avoided. Clinicians should also be aware of the dimensional changes that take place when multiple adjacent teeth are removed. It is often necessary to replace the missing soft tissue by addition of pink porcelain to the cervical regions of the prosthesis.

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Ongoing modelling of the alveolar bone may cause flattening of the ridge and thinning of the mucosa over time. Clinicians should attempt to reconstruct the natural morphology of the ridge and mimic the appearance of a root emergence by grafting the external surface of the bone with bone substitutes that have a slow turnover rate.

When adverse aesthetic outcomes occur, options for treatment depend upon the aetiology of the recession. Recession caused by inflammation or thin mucosa in an otherwise properly placed implant can usually be corrected with soft tissue (connective tissue) grafts.

With mucosal recession caused by facial malposition of implants, soft-tissue grafting methods have limited success.

In severe malposition cases, the only practical solution is to remove the implant, reconstruct the ridge and insert a replacement implant in an optimal axial position.

In summary, achieving acceptable aesthetic outcomes with implants depends upon proper evaluation of the site and technically proficient placement of the implant with adjunctive augmentation procedures. When adverse outcomes occur, treatment options are limited. The adage that “prevention is better than cure” holds true for implants and adverse aesthetic outcomes.

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“Consider sex as an individual risk factor in the risk assessment of periodontitis”

An interview with Dr Christiane Elisabeth Gleissner on gender aspects in periodontal therapy

In recent years, gender aspects in periodontal disease have been described and studied by researchers worldwide. At the Europerio 7 congress in Vienna, Austria, DTI Group Editor Daniel Zimmermann had the opportunity to speak with Dr Christiane Elisabeth Gleissner, Germany, about the current state of research and why the sex should be considered as an individual risk factor in the risk assessment of periodontitis.

Daniel Zimmermann: Two years ago, scientists from the University of Maryland, USA, released a paper in which they claimed to have found a sexual dimorphism with regard to periodontal disease. Have any results been published since then that support their hypothesis?

Dr Christiane Elisabeth Gleissner: In a systematic review of the prevalence and the severity of periodontitis according to sex, the University of Maryland scientists attempted, for the first time, to find a sexual dimorphism in periodontal disease. They found little robust data on this subject. Out of almost 2,000 studies, only 12 were considered in the review.

These studies demonstrated that men have a higher risk of attachment loss than women. This sexual dimorphism was observed across different countries and cultures, and therefore cannot be explained by socio-cultural factors alone. The male sex, however, seems to be an independent risk factor for periodontitis. New epidemiological studies from Hungary, for example, have also confirmed a higher prevalence of periodontitis in men.

It is interesting to note that this dimorphism already existed 100 years ago, as shown by a recently published study of skeletons from the late 19th and early 20th centuries by a female Portuguese scientist.

There are also differences with regard to tooth loss, the final stage of periodontal disease, which affects women more than men—for which we have no explanation. The latest figures from the Study of Health in Pomerania (SHIP) in Germany confirm that among men and women of similar socio-economic status, women have fewer teeth. This study also reported associations with men’s marital status.

In comparison with women, men seem to be more susceptible to the more aggressive forms of periodontitis. What biological bases is behind this difference?

There is clear evidence in the literature for a sexual dimorphism regarding non-specific and specific immune systems. This is demonstrated by the fact that, for example, men are more frequently affected by severe infections like sepsis than women. In contrast, more women than men tend to develop autoimmune diseases like rheumatoid arthritis, Hashimoto’s thyroiditis and Sjögren’s syndrome.

The rejection of transplants is also more frequent in women. A possible explanation for this is that the immune system is controlled by genes and that approximately 1,000 genes that play a part in the regulation of the immune system are located on the X-chromosome. The sexual dimorphism can be at least partly explained by this.

Other than susceptibility, are there other aspects of disease that are influenced by sex?

If your question asks whether sexual dimorphisms are also known in systemic disease, then I can assure you that they are. Currently, particularly in the medical field, much effort is directed at researching sexual dimorphisms. We are aware of the fact that women and men exhibit different symptoms of cardiovascular disease, which results in different diagnostics and pharmacotherapy, which can significantly influence the prognosis. Findings by gender medicine in view of the associations between systemic disease and gingivitis in particular have become interesting for periodontology. There is still much to do in this respect.

Hormone balance changes with increasing age. Could this affect periodontal status in any way?

The influence of the endocrine system plays a central role when it comes to seeking an explanation for the differences between the sexes. Sex hormones, in particular, appear to be able to explain a high number of sexual dimorphisms of the immune function. There is no doubt that circulating sex hormones modulate the innate and adaptive immune response and, consequently, susceptibility of the host to infection. Periodontal disease with inflammation becomes more frequent with increasing age. We also know that the endogenous production of hormones in women and men changes significantly in old age. Therefore, it seems obvious to look for causal relations.

What other aspects could be responsible for sexual dimorphism with regard to periodontal disease?

Like most multifactorial diseases, periodontal disease is the result of a complex interplay between microorganisms, the immune system of the host and economic factors. There is evidence of sexual dimorphism regarding oral micro fauna in patients with periodontitis. Concerning socio-economic factors and lifestyle factors like the consumption of nicotine, alcohol and fruit or vegetables, the differences between men and women are well known and documented. Unfortunately, this knowledge has not been incorporated into the risk assessment yet. To date, it cannot be shown whether the mentioned differences in periodontitis prevalence can be explained by nicotine consumption because we lack results from relevant studies concerning sex.

What effect could this knowledge have on the risk assessment of periodontal treatment?

It is desirable to consider sex as an individual risk factor in the risk assessment of periodontitis. In view of a patient-centred approach to periodontology, it becomes increasingly important to recognise the individual needs of the patient and incorporate them into the therapy and long-term care. Supportive periodontal therapy in particular benefits from our ability to convince patients of its long-term value.

The fact that men and women should be motivated differently has been successfully demonstrated by the advertising industry. A sex-specific communication concept can be of high value and would be, at least from my perspective, a significant step in achieving long-term success, since it respects the different needs of the sexes.

Besides this, is there anything else that clinicians should be aware of in treating men and women?

I do not think that women and men should be treated differently—although scientific data in this field is also lacking. Priorities of anamneses and clinical diagnostics for male patients will probably be different from those for female patients. Furthermore, knowledge gained from medicine and pharmacology regarding sex-related aspects has to be integrated into periodontal therapy, such as the selection of analogics and antibiotics or the care of female patients with diabetes mellitus, who tend to develop more complications than men.

It may also be necessary to reflect critically upon one’s own practice concept and adjust it to the different needs of men and women. This could include the design of educational material, the length of treatment, the organisation of adjunct long-term care and prospective discussions. Individualised care by the dental team will generally lead to an improvement in oral health, regardless of the patient’s sex.

Thank you very much for this interview.

Dr Christiane Elisabeth Gleissner speaking at Europerio 7 in Vienna. (DTI/Photo Daniel Zimmermann, DTI)

“Sex hormones appear to be able to explain a high number of sexual dimorphisms of the immune function.”
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“Lecture theatre”—a new interactive concept—on chairside CAD/CAM dentistry

An interview with Dr Michael Dieter, Ivoclar Vivadent, Liechtenstein

To be held for the first time in South-East Asia, the seventh CAD/CAM & Computerized Dentistry International Conference in Singapore in October will offer a detailed overview of the latest CAD/CAM technologies that are aimed at helping dentists achieve aesthetic and long-lasting all-ceramic restorations chairside. During a presentation in Cape Town, South Africa, Dental Tribune Asia Pacific had the opportunity to speak with Ivoclar Vivadent’s Dr Michael Dieter lead of the International Center for Dental Education, who will be hosting the lecture theatre together with Jörg Vogt, international CEREC trainer for Sirona.

Dental Tribune Asia Pacific: Dr Dieter, your joint presentation with Mr Vogt in Singapore will be held in form of a lecture theatre. What is behind this concept?

Dr Michael Dieter: Jörg Vogt and I developed this concept two years ago. When the organizer’s managing director, Dr Dobrina Mollova, saw our performance at the sixth CAD/CAM & Computerized Dentistry International Conference in Dubai last year, she named it a “lecture theatre” because of its truly interactive nature. Jörg and I present in continuous dialogue with each other, which makes the lecture more interesting, not only for the audience but also for us. Additionally, case demonstrations with the CEREC AC will be performed live on stage.

Primarily, our lecture is aimed at dentists who are interested in minimally invasive aesthetic treatment solutions or who simply want to get into dental CAD/CAM technology. Our goal is to provide a guideline clinical treatment sequence for predictable treatment using chairside CAD/CAM technology. However, the lecture is also suitable for any dentist who is interested in all-ceramics as a modern restorative treatment option.

From my experience, I can say that many practitioners still have little knowledge of what all-ceramic material they are supposed to use for various clinical situations. With our lecture theatre, we aim to demonstrate the main differences in terms of aesthetics, particularly for use in the anterior dentition, and the physical properties or strength of the various all-ceramic systems. What do you think the reason is for this lack of knowledge? Recently, we have seen the rapid development of materials and technologies. For the practitioner, it is sometimes difficult to keep up with all these new developments. This is why continuous education is becoming more and more important.

If we look at the increasing number of all-ceramic systems on the market that manufacturers claim to be aesthetic, we can in fact perceive significant differences. The questions remain: what does “aesthetic” mean, and how suitable are these materials commonly used metal alloys or metal ceramics. If mistakes are made at the beginning, fracture of the restoration becomes much more likely. Therefore, preparation techniques for all-ceramics with regard to CAD/CAM application will be in focus as well.

What impact has CAD/CAM technology had on the usage of aesthetic restorations in the dental practice? With CEREC, CAD_CAM technology has been available for chairside application for more than 27 years. So this is a well-documented process with long-term clinical success. Today, there are approximately 34,000 CEREC units in use, which demonstrates impressively that cementation is a very important factor and still underestimated by many dentists.

What are the aesthetic limitations of chairside CAD/CAM? Generally, posterior restorations like inlays, onlays, partial crowns, full crowns and veneers. In addition, up to four-unit posterior bridges are now possible, either as a temporary solution with polymer blocks (e.g. Telio CAD, Ivoclar Vivadent) or as a permanent restoration with a high-strength zirconium dioxide/lithium disilicate material (e.g. IPS e.max CAD-on, Ivoclar Vivadent).

What are the critical factors for achieving successful long-term clinical outcomes? In addition to the factors described above, cementation, particularly for glass-based ceramic restorations, is a clinical step of paramount importance for long-term clinical success, since it is directly linked to the aesthetic outcome and the fracture strength of the final restoration. Which ceramics have to be bonded? Which ceramics can be cemented conventionally? How does one prevent post-operative sensitivity after cementation? All these questions will be answered in detail during the lecture.

Many speak of CAD/CAM technologies as the next revolution in dentistry. Do you agree? I would say that the revolution will continue. I am still fascinated by the materials and the manufacturing process. All-ceramic restorations are not only aesthetically pleasing but also minimally invasive. Therefore, patients benefit not only from better looking teeth, but also from the fact that much less natural tooth substance has to be removed compared with traditional restorative techniques and materials.

The next few years will show what CAD/CAM manufacturers have kept in reserve, both chairside and labside. Materials manufacturers like Ivoclar Vivadent will continue to develop highly aesthetic and user-friendly all-ceramic systems that aim to further reduce the minimal material thickness—requiring even less invasive tooth preparations—to the benefit of the patient.

Thank you very much for this interview.

Christian organisation in the Philippines breaks dental world record

MANILA, the Philippines: Recently, a medical and dental mission organised by the Church of Christ in Manila in the Philippines broke the world record for the most people involved in a dental health check. Over 4,100 people were examined within eight hours by the mission in the Philippines’ capital in the second weekend of July, according to Guinness World Records in London.

The previous record was 3,377 people, checked during an oral health event organised by the Indian Dental Association and Weigley in Mumbai in October 2009. With 66,322 people checked, India still holds the world record for the most people involved in a dental examination in multiple locations since November 2010.

Guinness currently recognises a couple of dental records, including the longest tooth extracted and the oldest person to have received dental implants.

In addition to the most dental checks performed on one day, the Manila mission also broke two other records in the most blood pressure readings and blood glucose level tests categories. According to Guinness representative Tarika Vara, it was the first time that three records were broken simultaneously. She remarked that the standard of the health checks was very high and of great benefit to all those involved.

Over 1,000 medical and dental professionals are reported to have taken part in the event, which saw overall attendance by 100,000 people. The mission also provided medication, minor surgical treatment and relief food packs.
BRISTOL, UK: The evolutionary origin of dental structures is highly debated among experts. Now, a team of international scientists has found evidence that tooth-like structures were present in the first jawed vertebrates, although it had long been assumed that teeth developed later. The new findings indicate that teeth developed alongside or shortly after jaw structures.

The researchers discovered the origin of both teeth and jaws through studying fossils of Compagopiscis, one of the first prehistoric jawed fish. While performing 3D microscopy, they were able to visualize every tissue, cell and growth line within the fish’s jaws, allowing them to study the development of the teeth, said Dr Martin Rübsch, lead author and researcher at the University of Bristol’s School of Earth Sciences.

The team reported that the specimen was considered to be “one of the most ancient anthropological remains from the northern-Adriatic area.” But the find had never been subjected to detailed analysis until the researchers secured permission to study the mandible using state-of-the-art scanning technology and radiocarbon dating techniques.

Permission was granted by Italy’s Natural History Museum of Trieste, to whom the original finders had donated the specimen. The mandible, determined to be from a male who died in his 20s, was described by the team as, “the left portion of an isolated adult mandible bearing a canine, two premolars, and the first two molars.”

The 12-person team of researchers from university and governmental facilities in Italy and Australia used synchrotron radiation computed microtomography, accelerator mass spectrometry radiocarbon dating, infrared spectroscopy and scanning electron microscopy to separately analyse the tooth, bone and filling material.

Based on the radiocarbon analysis, the mandible was dated to an age range of 6,655–6,440 years Before Present and the filling 6,645–6,440 years BP.

The researchers listed several previously known examples of ancient dentistry but said there was no known published documentation of the use of “therapeutic palliative substance in prehistoric dentistry.” The research team also referenced an isolated adult mandible associated with contemporaneous beeswax, covering the occlusal surface of a canine, could represent a possible case of therapeutic use of beeswax during the Neolithic.”

In a note regarding the funding of the research project, the team wrote, “This work is part of the ICFP Ettelico EXACT Project (Elenental X-ray Analysis and Computed Tomography) funded by Frami Venezia Giulia (Italy). The funders had no role in study design, data collection and analysis, decision to publish or preparation of the manuscript.”

The team’s paper is titled, “Beeswax as Dental Filling on a Neolithic Human Tooth.”

“Growing a tooth in the future?”

Researchers from Ireland think that coconut oil may be of great interest to the oral health industry in the future because a new study has found that its natural antibiotic properties strongly inhibit the growth of bacteria that cause oral infections. They suggest that the oil could be integrated into commercial dental consumer products to combat tooth decay.

In clinical tests, the researchers discovered that coconut oil that had been treated with enzymes similar to those found in the digestive tract was most effective in blocking the development of most strains of Streptococcus bacteria, including Streptococcus mutans. Additional tests revealed that the same enzyme-modified variant of coconut oil was also harmful to Candida albicans, the yeast that causes oral thrush, among others.

Coconut oil could reduce caries

Hopes of growing teeth have been supported by the occurrence of supernumerary teeth in the jaws, as well as fully developed teeth in teratomas. The issue of tooth bioengineering has been taken up again more recently, as scientific breakthroughs in the fields of genetics and developmental biology have led to a completely new level of understanding about how teeth develop. Basically, tooth formation is regulated by a chain of interactions between two different tissues, epithelium and mesenchyme. And importantly, we actually know that the language that cells and tissues use for communication consists of defined signalling molecules.

The question of the origin of cells for human tooth bioengineering is still unanswered. Adult human teeth do contain stem cells but they may not provide a suitable source. Therefore, it is likely that non-dental cells will have to be reprogrammed for the purpose of clinical tooth regeneration. In addition, there are several other remaining challenges such as the questions of tissue size, tooth identity, crown shape, and composition of the mineralised tissues. The creation of functional roots presents perhaps the biggest challenge that needs to be addressed before bioengineering of teeth will be feasible.

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Faster voice recovery

SINGAPORE: Singaporean scientists have designed a new system to help patients who have undergone larynx removal to speak again in a single surgery. In comparison with existing methods, their invention not only reduces the number of surgical steps but also increases accuracy of placement of a voice prosthesis and allows for immediate voicing.

Conventionally, various surgical steps are involved in the insertion of a voice prosthesis. Doctors need to make several cuts into the trachea and the oesophagus, while, at the same time, a guide-wire is inserted into the fistula to prevent the creation of a false passage. Two dilators are then inserted to widen the fistula.

Previously, a temporary rubber tube was placed into the fistula and the voice prosthesis was inserted about two weeks later, explained the researchers. They think, however, that their newly developed technique can reduce the time needed to restore the patient’s ability to speak to ten minutes after the initial procedure. It offers a one-step solution, reducing the complexity of the surgery and saving patients discomfort and money, said Dr David Lau, the project’s consultant ENT surgeon at Rafles Hospital in Singapore.

“Until now, good sizing of the prosthesis was achieved through trial and error,” said Dr Chui Chee Kiong, project leader and assistant professor at the at the National University of Singapore’s Department of Medical Engineering. “Now we are able to merge all the steps into a single procedure. Our system ensures an immediate snug fit of the prosthesis in the passageway created between the trachea and the oesophagus.”

Owing to tissue change and wear, voice prostheses need to be changed, which entails fitting them each time. “Our invention offers patients a more fuss-free system, reducing time and discomfort,” added Ching Chinn Boon, a research engineer at the university.

Cases of seppuku are reportedly increasing in Japan

Oral health linked to arthritis

Although previous studies have found a link between rheumatoid arthritis and tooth loss in patients, the complex relationship between the two conditions is not yet understood by scientists. However, the findings of a new study, presented recently at the Fresh Science national finals in Melbourne, Australia, suggest that it might be possible to treat gum disease and severe arthritis simultaneously.

In laboratory tests, the researchers replicated both conditions, which are the result of inflammatory responses in the body, by inducing gum disease and arthritis in mice. They found that animals with gum disease developed significantly worse arthritis. In addition, they observed signs of bone loss in the jaws of mice with arthritis alone and signs of bone loss in the joints of mice with gum disease alone. The researchers are now testing whether treating periodontitis could also help to reduce the symptoms associated with arthritis by researching histone deacetylase inhibitors.

Evaluate the dental workforce system

Last year, the Indonesian government announced legislation to stop dental technicians from performing dental treatment. This regulation was originally planned to come into force six months later in order to give the government time to implement short- and long-term planning and to reach consensus among all stakeholders on this issue.

The first law on dental technicians, introduced in 1969, legalised this profession and issued them with the authority to provide patients with removable and partial acrylic dentures only. This regulation, however, was never really enforced for unknown reasons. Therefore, it has become common for dental technicians to also place fillings, fabricate and place fixed dentures, and perform orthodontic treatment and even extractions without the necessary education. As a result, no new registrations of dental technicians have been permitted since 1989.

Although political stakeholders still argue over the real cause of the dental health crisis in Indonesia, it might be the result of a complex inter-relation of factors. Socio-economic disparity has created an imbalance in accessing dental care, resulting in services that are focused on income rather than actual need. The costs of dental treatments have exploded owing to the absence of pricing regulations, forcing disadvantaged parts of the population to rely on dental technicians to maintain their stomatognathic function, and resulting in often illegal practices. Recent reports have also described the high, unmet demand for and persistent inequality in dental care in Indonesia owing to the dental workforce shortage, as well as geographical and economic barriers. A lack of commitment to preventive community-based dental health promotion might also be a factor. Prevention is still very far from being appreciated. Needless to say, investment in prevention is still rare in this country.

The Indonesian government has demonstrated its willingness to improve the nation’s dental health by committing itself to the establishment of a universal health-care coverage system. However, it is also time to evaluate the dental workforce system and start distinguishing clearly between the authorised roles of dentists, hygienists and dental technicians. Moreover, resisting globalisation is like defying the law of gravity; therefore, increasing the quality and quantity of the dental workforce based on need is necessary for competing in the global market.

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Evaluate the dental workforce system

Dentists take part in military-led aid mission to Asia Pacific

International humanitarian campaign aims to provide treatment for more than 20,000 people

WASHINGTON, DC, & SAN DIEGO, CA, USA: In one of the worst natural disasters in recent times, the Boxing Day tsunami killed more than 200,000 people in South-East Asia. Following the call from humanitarian missions organised by the Pacific Partnership have been conducted in the region each year since 2006. Recently, the first support troops including military dental providers were deployed from around the world for this year’s campaign.

According to Mission Commander US Navy Captain James Morgan, who spoke to reporters before embarking, the joint exercise will see repeated visits to regions and islands in Indonesia, the Philippines, Cambodia and Vietnam during the next two months. Up to 100 dental providers will be joining the mission, which is budgeted at US$20 million and expected to resume in early August.

“While at a host nation, I expect we’ll see anywhere from 60 to 100 patients daily, and sometimes, patients need more than one procedure performed,” commented William Robinson, a US Air Force major and dental provider from San Antonio.

Besides dental services like teeth cleaning and extraction, military personnel will also provide other medical and engineering aid, as well as training to local medical professionals.

Approximately 1,000 professionals, both military members and civilians, are expected to join the mission, which, according to Captain Morgan, is supported by non-governmental organisations such as the San Diego Pre-Dental Society and intended to enhance international cooperation, as well as regional capability for future emergency response. Several countries, including France, Singapore and South Korea, are participating for the first time, he said. Besides the US, Canada, Japan, New Zealand and Australia have contributed resources regularly since the beginning.

The last mission in 2011 provided treatment to more than 21,000 patients.

The Partnership is hosted by the US Navy, which also provides major transportation and logistic support through the USNS Mercy, one of its two currently operating hospital ships. According to Captain Morgan, it will offer capacity for between 300 to 150 surgeries per day offshore and on land.

With almost 200 ships and more than 300,000 troops in the region, the US Pacific Fleet is currently the largest naval military power in the Asian Pacific region. During a visit to the region in November last year, US president Barack Obama announced his intentions to strengthen US-AP relations to promote stability in the region, of which the Partnership is considered an essential part.

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Digital dentistry conference draws over 500 to Singapore

SINGAPORE: Attendance figures for the first CAD/CAM & Computerized Dentistry International Conference in the Asia-Pacific region have exceeded original expectations, the Center for Advanced Professional Practices (CAPP) has announced. According to its figures, more than 520 dental professionals took part in the event, which was sponsored by major market players and saw 14 lecturers from around the globe presenting in fields like computer-guided surgery and 3D dental imaging.

Plans for a follow-up conference in the city-state are already being discussed and will be announced in the coming weeks. CAPP officials recently told Dental Tribune Asia Pacific the event will be held in autumn next year after the organisation’s eighth Dubai congress scheduled for May 2013.

CAPP has been organising conferences for dental CAD/CAM and computerised dentistry in the emirate since 2006. As a spin-off of its successful annual series there, a conference was organised for Asian dentists for the first time this year. Besides a three-day scientific programme, it offered a theatre presentation on chairside CAD/CAM-fabricated restorations, as well as a parallel session that aimed to provide dental technicians in the region with an overview of the latest digital technology and guidelines for its use in dental labs.

DT Asia Pacific

World Dental Federation faults WHO plans on noncommunicable diseases

Daniel Zimmermann

GENEVA, Switzerland: The FDI World Dental Federation has issued concerns about a number of action documents recently made public by the World Health Organization with regard to noncommunicable diseases (NCDs). In a statement released on its website, the dentists’ organisation criticised the documents for not paying sufficient attention to oral diseases, which it says should be classified as a key NCD by the WHO, along with cancer, diabetes, as well as cardiovascular and respiratory diseases.

In a circular note, the FDI also called upon its members to contact their respective national health officials immediately to ensure that the issue of oral health will be included in the upcoming WHO consultations on the plan, as well as the organisation’s next executive board meeting in January. According to the WHO sources, the draft is to be discussed during an informal consultation in Geneva in early November, which will involve member states and several UN agencies.

Published on 12 October, the paper “Global action plan for the prevention and control of noncommunicable diseases 2013–2020” identifies the threat of NCDs to achieving health-related development goals in low- and middle-income countries and provides recommendations on addressing the situation over the next seven years.

NCDs currently account for 36 million deaths worldwide each year with the majority to be occurring in less developed countries, according to Geneva-based organisation.

While admitting to current constraints of the WHO, the FDI said in its statement that the leadership role of the WHO is essential to keeping oral health a priority in the fight against NCDs. It stated that it had addressed a formal request to the organisation for the inclusion of oral health in its next general programme of work, which will determine the WHO’s budget and goals over the next five to six years.

“The WHO recognition of oral disease is essential to support and consolidate the significant role the dental profession plays in the prevention and control of NCDs,” FDI President Orlando Monteiro da Silva told Dental Tribune. “WHO is a governmental organization so, while FDI can monitor and advise, governments alone are in a position to change WHO strategy and policy. That is why we are calling upon our member dental associations to contact their national society and ensure the oral health message is communicated within WHO.”

The FDI has been lobbying heavily for the inclusion of oral diseases in the WHO’s list of NCDs for years. In February 2011, for example, Executive Director Jean-Luc Eisele spearheaded a submission by the World Health Professions Alliance (WHPA) during a civil society hearing at the UN headquarters in New York, stating that oral diseases share common risk factors with existing NCDs and have a major impact on society.

The federation is also offering an NCD toolkit for both patients and health professionals, which features a health improvement card, among other things, as part of the larger NCD campaign conducted in partnership with the WHPA.
Schein Dental expands into Asia
Dental equipment provider also buys US ortho and lab biz

COPENHAGEN, Denmark: Celebrating the achievements of implant dentistry in the last 20 years, thousands of clinical specialists from Europe and around the globe recently gathered at the Bella Center exhibition and congress venue in the Danish capital for the annual scientific congress of the European Association for Osseointegration (EAO). Following a successful event in Athens last year, the congress event more than 2,300 scientists and clinicians involved in implant and restorative dentistry over the course of four days.

Besides an extensive scientific programme covering topics like imaging and factors of implant loss, the event saw a record number of companies exhibiting established clinical solutions and a number of new products, including dental implants and sophisticated surgical equipment. Market leader Nobel Biocare, for example, had its new OsseoCare Pro drill motor, which can be operated entirely through Apple’s iPad tablet computer, on display. Italian manufacturer mectron presented its multi-piece pro device, which can be used for ultrasonic implant cleaning, in Copenhagen.

New implant devices were exhibited by MIS Implants, MegaGen and BioHorizons.

Held for the 20th time, the EAO’s latest annual meeting looked back on various issues related to implant dentistry from the last two decades. Acknowledging the progress being achieved in the field, a Saturday morning session titled “Future perspectives of implant dentistry” discussed future prospects of bioactive implant surfaces and the use of computer-guided implant planning, among other topics. For the first time, a session organised by members of the EAO’s Junior Committee also presented new revolutionary ideas that could shape implant dentistry in the years to come.

Having originated from a clinical meeting by implant specialists in the late 1980s, the EAO is today an established authority and one of the most important scientific and clinical forums for implant dentistry in Europe. It is comprised of renowned clinicians and researchers from around the world. With more than one third of visitors coming from regions outside the continent, its annual scientific congress has recently gained more relevance internationally.

BANGKOK, Thailand: In a recent acquisition spree, Henry Schein has bought a major share in dental products provider Accord from Bangkok. While financial details of the deal were not disclosed, the Thai company is expected to add US$15 million in sales to Schein’s global dental business and expand its position in the growing Asian dental markets.

In addition to its purchase of Accord, the world’s largest supplier of medical and dental products has bought Ortho Technologies, a provider of orthodontics supplies, to facilitate the growth of its orthodontics offering. In a third buy, Henry Schein has also acquired a medical laboratory service provider MLS in Bakersfield, California.

The partial takeover of Thailand’s largest dental dealer may come as a surprise for some, as Henry Schein had earlier announced that it was pursuing growth opportunities in Asia but mentioned expansion into India and China as its first priority. Chairman and CEO Stanley M. Bergman said in a statement that the latest acquisition of Accord will not only give his company the opportunity to establish its presence in the fifth largest dental market in Asia, but also serve as an anchor for further expansion into South-East Asia.

According to figures from the US Commercial Service in Bangkok, the heavily import-driven dental market in Thailand was estimated to be worth more than US$120 million in 2008. Run by the Charasathitkul family since 1976, Accord currently distributes dental products, including well-known brands from global manufacturers like Shofu, Planmeca and the GC Corporation, to over 5,000 customers in Thailand. Through the acquisition, the family will still retain 25 per cent of its former business, while Henry Schein will hold the remaining 75 per cent, both companies said last week.

Henry Schein maintains other business operations in the Asia-Pacific region through affiliates and subsidiaries in Australia (Henry Schein Haas) and New Zealand (Henry Schein Shalloom). Since last year, the company has also distributed its dental portfolio through Aniam Biomedical to customers in Hong Kong and the People’s Republic of China.

Worldwide, Henry Schein operates in 26 markets with a focus on North America and Western Europe. Last year, the company reported record sales of US$8.5 billion through its medical, dental and veterinary businesses.
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<th>Dental abscess</th>
<th>Cellulitis</th>
<th>Gingivitis</th>
<th>Gingivectomy</th>
<th>Injury to wisdom tooth</th>
<th>Extraction of the impacted tooth</th>
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