Nobel Biocare announces entry into metal-free implant market

“The first truly metal-free, two-piece screw-retained implant solution.”

Sequencing of sea cucumber genome may help with tissue regeneration
“Research on PEEK implants is both challenging and motivating”

An interview with Dr Pär Johansson, Sweden

By Monique Mehler, DTI

In 2010, Dr Pär Johansson received his dentistry degree at Malmö University in Sweden, where he submitted a master thesis on implant surfaces. A few years later, he joined a research team at the same department as they were launching an interesting project on a new implantable material, PEEK (polyether ether ketone). In an interview with Dental Tribune, Johansson spoke about the advantages and challenges of PEEK implants and what the new material could mean for the future of implantology.

What, in your opinion, has been the greatest development in dental implantology throughout the decades?

Since the discovery of osseointegration, the development of dental implantology has been extraordinary and extremely fast. The advancement began by experimenting with different implant materials and inventive shapes and forms. Thereafter, the implant surface was modified using several subtractive and additive methods to shorten the healing time and increase the success rate. Today, researchers are attempting to improve osseointegration by loading the implant surface with pharmaceuticals or proteins. As a researcher, I would say that the most important developments in dental implantology have been the surface improvements and, to some extent, our understanding of bone and implant interaction. As a clinician, the greatest developments have been improved treatment protocols and the implementation of digital applications.

At the 2017 European Association for Osseointegration (EAO) congress, you gave a lecture about PEEK implants. What was your motivation behind specialising in this implant material?

The project became my PhD project, which I am defending later this year. PEEK is a highly advanced polymer with properties that could improve the treatment outcomes of several procedures. The challenge is that PEEK is not optimal as a load-bearing implant because of the bioinert surface which does not osseointegrate without modification. Therefore, research on PEEK implants is both challenging and motivating, particularly since the arena of applications, especially in dentistry, is so unexplored.

It has been argued that implantable PEEK polymers are a next-generation biomaterial. Is that fact or fantasy?

I would say that PEEK has come a long way to becoming the next-generation biomaterial in the orthopaedic field. Today, PEEK is the standard implant material in several spinal procedures and ongoing research has introduced more applications. In dentistry, the introduction of PEEK has been slow, but the material may well be functional in healing abutments, temporary cylinders and dental frameworks. Introduction of new biomaterials is a slow process which requires a comprehensive evaluation by the U.S. Food and Drug Administration before it can be implemented for clinical trials. PEEK-OPTIMA (Invibio) is currently the only commercial PEEK polymer approved by the FDA as a medical device.

What are the main advantages of PEEK in comparison with conventional implant materials like titanium? What are its limitations?

The main advantage in spine and trauma surgery is its superior biomechanical properties compared with metals. PEEK has an elastic modulus similar to that of human bone, while that of titanium is almost eightfold higher. Differences in elastic modulus between the implant and the surrounding tissue may promote stress shielding and inhibit bone growth or lead to bone resorption. Furthermore, titanium and metal alloys have, in some documented cases, caused signs of hypersensitivity and allergy.

These days, there is also an increasing demand for non-metallic restorations and biomaterials. PEEK is bioinert, has a non-reactive surface and, according to current literature, has never shown any signs of provoking hypersensitivity. The colour of PEEK is more natural, and this enables the manufacturing of aesthetic implants for thin biotypes and diverse dental components. Finally, PEEK is transparent to X-rays, which is a feature highly useful after spine surgery, allowing the postoperative radiograph to be viewed and analysed without any disturbing artefacts.

The results of a study in rabbit bone you conducted in 2016 proved that the addition of a nano-sized hydroxyapatite coating to PEEK surfaces improved the bone-implant contact and demonstrated strong osteoconductive properties at the perforation. How important are these findings to advancing research on PEEK implants?

This aforementioned study is the third by our research group on PEEK. There were two main areas of investigation regarding the material used in this study, the use of PEEK as a biomaterial and the innovative coating technique by which a nano-sized hydroxyapatite coating is applied to the implant surface. Further, this study evaluated a PEEK implant with a unique design: the implant is manufactured with an apical perforation to enable evaluation of the bone fusion.

The design is mainly aimed to be correlated to spinal applications where PEEK implants are currently used as cages between the vertebrae to facilitate bone fusion. The results of this study show the significant effect of surface modification using nano-hydroxyapatite. These outcomes are important in inspiring and facilitating future research on PEEK and nano-hydroxyapatite. This coating technique can further be applied to PEEK implants with other design and surface properties of the core material.
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Hidden danger: Contamination of sterile-packaged implants

Why we need a global initiative for clean dental implants

By Dr Dirk U. Duddeck, Germany

Residues on sterile-packaged implants, particularly organic particles from the production or packaging process, are highly suspected of being responsible for incomplete osseointegration of dental implants or even a loss of bone in the early healing period. Studies in recent years have shown that neither the CE marking nor U.S. Food and Drug Administration (FDA) clearance provide a reliable indication of the cleanliness of dental implants. In March 2017, a new initiative was presented at the International Dental Show in Germany that focuses on this topic for the safety of both dentists and patients.

In three consecutive scanning electron microscopy (SEM) studies, scientists of the University of Cologne and the Charité—Universitätsmedizin Berlin in Germany analysed more than 200 sterile-packaged implants since 2007. Results from the most recent study and comparisons with previous years showed an alarming increase in implants with conspicuous residues. An increasing number of practitioners have concerns about the biological response to these impurities, and the possibility of legal implications has arisen. The question we must ask is: how can the clinician know which implants are not affected by these impurities? Owing to the variety of implant systems offered on the market, it has become quite difficult for the individual dentist to find a safe system for his or her practice.

The CleanImplant Foundation has set itself the goal of providing exactly this information worldwide. This independent non-profit organisation is supported by a scientific advisory board made up of well-known scientists and practitioners, such as Prof. Tomas Albrektsson (University of Gothenburg, Sweden), Prof. Ann Wennerberg (Malmö University, Sweden), Prof. Florian Beuer (Charité, Germany), Prof. Jaafar Mouhyi (Universiapolis—International University of Agadir, Morocco), Dr Luigi Canullo (private practice, Italy) and Dr Michael Norton (private practice, UK), President of the US Academy of Osseointegration. In September 2017, this group of scientists released a consensus paper providing objective evaluation criteria for a clean implant, awarding...
The five-step approach

**The CleanImplant Trusted Quality Mark**

**Step 1** Unbiased sampling
3 implants from the factory and 2 implants from practices via ghost shopping

**Step 2** Unpacking and scanning in clean room conditions
Samples are unpacked and scanned under clean room conditions according to Class 100 US Fed. 209 and Class 5 DIN EN ISO 14644-1

**Step 3** Accredited process of analysis
SEM imaging and elemental analysis (energy-dispersive spectroscopy) according to DIN EN ISO/IEC 17025 accreditation process (competence of testing and calibration laboratories) with external audits and multi-annual reassessments

**Step 4** Full-size SEM images
Digitally composed SEM images of more than 360 single SEM images at a magnification of x500 always show the complete surface, i.e. no cherry-picking of clean-looking areas

**Step 5** Peer-reviewed evidence and proof of sufficient clinical documentation
Two members of the scientific advisory board independently sign the comprehensive report of analysis and proof of the corresponding clinical documentation providing valid data on a 95% survival rate
The role of prevention in implantology
Increasing patient compliance and treatment outcomes through saliva diagnostics

By Dr Peter van der Schoor, Netherlands

In October last year, I had the honour of speaking in front of a medical and dental audience to explain my approach to prevention. In my lecture, I talked about our new “perioprofiling” approach using saliva and aMMP-8 diagnostic methods.

The thing is, we need to treat patients between the ages of 20 and 40 differently to those who are 40 years and older. Certainly, everyone can get periodontitis, but my younger patients visit my dental practice less frequently, so they can get periodontitis, but my younger patients visit my dental practice less frequently, which means they are at a higher risk of developing periodontal diseases. Interestingly, we have always had difficulty achieving the necessary compliance from patients in this younger age group to obtain good dental hygiene in order to prevent periodontitis.

Also, we have found that well-known diagnostic methods, such as PSI or BOP, do not necessarily “look ahead”, nor are they predictive—which is exactly what we need to make sure we are not always too late with our treatment. Now, finally, we have found a way to do this.

The well-documented collagen destruction indicator, aMMP-8 can be measured in the saliva (with PerioSafe) and, for us, the new gold standard for predictive analysis in preventive dentistry. It helps us identify the patients with the greatest need for preventive treatment and at the right point in time, which is when the sub-clinical collagen destruction of periodontal tissue has started, but it is not yet visible.

Fortunately, the Dutch public health insurance system has recognised the “predictive value” and solid scientific data of aMMP-8 diagnostic methods and is going to fully reimburse the cost of the diagnostic treatment for every patient by 2018. This decision is a breakthrough for targeted healthcare in dentistry.

A proven concept
At my practice, we ran a study with over 200 periodontally-healthy patients, between the ages of 20 and 40 years old. Each patient received a free PerioSafe test. Interestingly, 40 percent of these participants tested positive for the presence of aMMP-8. All of these patients wanted to stay at our practice for an oral hygiene treatment. Of the other 60 percent who had a negative result, around ten percent still asked for an oral hygiene treatment. This means that only one test is necessary to triple the number of dental hygiene procedures for 40 percent of the patients in your practice.

I have done over 30,000 implants in my life and about ten percent of those have failed. The overwhelming majority of failures were due to patients developing peri-implantitis. For patients who would like to have implants, we first have to determine what has gone wrong with their natural dentition. Which is why, prior to implant placement, we use the PerioSafe test to evaluate whether there is silent inflammation that might need attention. After the implant surgery, we use the ImplantSafe test for regular monitoring to prevent peri-implantitis. The patient has to test negative for aMMP-8 to guarantee tissue stability and since our strategy is sustainability, aMMP-8 is the most effective diagnostic tool available to date.

Looking forward, we now have to step into the world of digital saliva diagnostics that is performed as a chair-side, aMMP-8 quantification with the ORALyzer, which is one of the biggest inventions in dentistry, because it allows us to precisely look at the patient’s immune response system and print out an analysis report within a couple of seconds. This tool is exactly what we need to fight peri-implantitis and periodontitis. With the ORALyzer can even measure the success of our treatment by seeing a reduction of aMMP-8 concentration in the saliva, measured in ng/ml.

Some dentists think they cannot earn money with prevention, but I want every dentist to understand that 40 to 50 percent of all patients will need two to four dental hygiene procedures per year to prevent deterioration. aMMP-8 saliva diagnostics open the door to much needed “patient targeting” and “compliance” and there is nothing else available that can compare to it at this point in time. It is a prevention need indicator and a patient motivator. Simply do the calculation for yourself, it is a win-win for the dentist and the patient.
Shanghai event breaks records

By DTI

SHANGHAI, China: Exceeding all expectations, the third National Osteology Symposium in China welcomed about 3,000 participants to Shanghai, making it the biggest national event in the foundation’s history. Also setting new standards for future congresses was the innovative stage design. The main platform was located in the centre of the hall and allowed speakers to address the surrounding audience at 360°.

According to the organiser, Osteology Shanghai 2017 chairman Dr Massimo Simion and Wang Xing put together an astonishing programme covering all aspects of oral tissue regeneration and providing the latest insights from research, in line with the foundation’s motto “Linking science with practice in regeneration.”

With almost 3,000 participants, the Shanghai symposium held on 20 and 21 September saw a huge leap in attendance figures compared with the 2014 event, which had 1,200 participants, and the first Chinese symposium in 2012, which took place in Xi’an and had 800 attendees.

Osteology Shanghai was the fourth national symposium held this year. The previous ones took place in June in Tokyo in Japan and Melbourne in Australia—the first Osteology meeting ever held in Australasia—and in February in Barcelona in Spain. The next and last National Osteology Symposium in 2017 will be Osteology Moscow on 21 and 22 October.

More information about future events can be found at www.osteology.org.

Geistlich introduces Fibro-Gide collagen matrix

By DTI

MADRID, Spain: As an alternative treatment option to connective tissue grafts, Swiss company Geistlich Biomaterials launched the Fibro-Gide collagen matrix at the Annual Scientific Meeting of the European Association for Osseointegration (EAO) in Madrid. The new product was developed for soft-tissue regeneration at the alveolar ridge around natural teeth and implants and will be available in two sizes.

According to the company, Fibro-Gide should be used as a submerged scaffold in areas where an increase in soft-tissue thickness is clinically desired. Its porous network supports the formation of new connective tissue (angiogenesis) and stability of the collagen network in a submerged healing situation. The smart linking of the reconstituted collagen provides volume stability.

Regarding handling, Fibro-Gide can be shaped to the desired dimensions in both dry and moist states and does not require pretreatment. Once the matrix is soaked, it adapts perfectly to contours and adheres well to the defect, the company added.

Geistlich Chief Scientific Officer Dr Terance Hart commented that the reason for developing the matrix was the increasing demand for volume-stable collagen matrices that could be used for indications such as soft-tissue augmentation around implants or under pontics.

"I am convinced that this is indeed a step forward in technology, and it has huge potential," Deputy Chief Scientific Officer Dr Mark Spilker said.

Intuitive operation and useful functions—Thommen Medical launches new app

By DTI

GRENCHEN, Switzerland: Swiss dental implant manufacturer Thommen Medical has launched a new app that gives users mobile access to the company’s product information round the clock. For users to explore the various Thommen implant systems, among others, in an innovative and interactive way, the app has an animation function that lets them zoom in on and rotate the respective features, such as the implant connection.

According to the company, the zoom function allows users to gain more information about the individual product features. Through the app, dentists will also have access to the latest instructions for clinical application of the company’s products and treatment concepts anytime—whether on the move or working chairside.

Complementing the service offerings are additional design options through which users can make notes in the app and exchange them by e-mail, or download documents to their mobile devices.

The Thommen app is available in Chinese, English, French and German and was developed for the iOS and Android operating systems. It can be downloaded free from the iTunes Store and Google Play. More information can be found at www.thommen-medical.com.