“One out of five implant patients are likely to develop peri-implantitis”

An interview with Dr Frank Schwarz, Germany

On Thursday, the German implantology expert Dr Frank Schwarz will be presenting a lecture on peri-implantitis. *today in-store* will be there to speak with him about the condition and the latest treatment approaches.

**today international:** Peri-implantitis seems to remain a huge clinical problem. What challenge does the condition pose to the dental community?

**Owing to the increasing number of dental implants placed, post-implant complications will be increasingly relevant in the future.**

**How many patients are estimated to be affected?**

**According to the current consensus statement by the European Association for Osseointegration, one out of five implant patients are likely to develop peri-implantitis.** Similar estimates concerning mucositis are lacking.

**Experts say that the number of implant treatments will increase above average in the next few years, particularly in Asia. What consequences will this have on the dental community in the region regarding peri-implantitis?**

**Besides the need for more research activities in this important field, measures have to be implemented to assure quality, as well as educational standards for dentists who want to offer implant treatment.**

**A number of treatment methods for peri-implantitis are available.** Considering the latest research findings, which of these are likely to have the most successful clinical outcome?

**In general, surgical procedures seem to have an advantage over non-surgical treatment approaches.**

**Is there one effective method of treatment or is it a combination of different methods that ensures long-term success?**

**For a successful therapeutic outcome, several factors have to be taken into account.** The configuration and morphology of peri-implant bone defects, which have been considered to be of lesser importance, seem to play a very important role actually.

**New implant and implant surfaces promise even better osseointegration.** Will this have an effect on the development and treatment of peri-implantitis?

**New implant modifications have to be studied and assessed with regard to these aspects.**

**What are the most promising treatment approaches, in your opinion?**

**When we use CBCT, we should really have an eye on how we use this technology.** The best way for us to demonstrate that we are appropriate users of CBCT is to follow the principles of justification and optimisation—and to show that we follow them. This means only using CBCT when it is going to answer a question that cannot be answered by other methods involving less, or no, radiation.

**Dose, risk, optimisation and justification with CBCT**

By Prof. Keith Horner, UK

**One cone-beam computed tomography (CBCT) is the most significant development in dental imaging during the last 25 years.** It brings cross-sectional imaging into the dental practice and has obvious advantages in implant dentistry. Concerns have been raised, however, over the radiation doses, which are usually higher than those of conventional dental radiography.

**When the word “radiation” is used, alarm bells ring for everyone.** One of the most common questions asked by dentists is how the dose of one X-ray examination (e.g., a panoramic radiograph) relates to another (e.g., CBCT). This is almost impossible to answer because there is a wide range of possible doses from any type of X-ray examination, reflecting differences in equipment, the image receptor, the field of view and so on. Recent reviews indicate that doses from CBCT are typically an order of magnitude greater than those from conventional dental radiography. The health risks from such exposures are also proportionately higher; although we can perhaps console ourselves by remembering that risk falls with patient age, and that many implant patients are in the older age groups.

**The foundations of radiation protection of patients are justification and optimisation.** Justification embodies the principle that all exposure to X-rays should give a positive net benefit to the patient. It is implicit within this that the X-ray imaging strategy should be “prescribed” for each patient and therefore that no imaging should be performed until a history and clinical examination have been performed. Referral criteria are an essential aid to the justification process, being clinical guidelines based on, at least, a solid body of evidence or, where the evidence is lacking, consensus. Optimisation is the principle that all exposure should be as low as reasonably achievable. As radiation exposure factors are reduced, image quality will fall, but lowering exposure to a point at which image quality is still adequate is an important strategy, as well as cutting down the size of the field of view.

**So, where do we go from here? CBCT is a great technological advancement, but that does not mean we must use it if a conventional radiograph, or good clinical examination, would be sufficient.** We have to recognise that regulatory authorities dealing with radiation in Europe are aware of CBCT in dental practice and are keeping a watchful eye on how we use this technology. The best way for us to demonstrate that we are appropriate users of CBCT is to follow the principles of justification and optimisation—and to show that we follow them. This means only using CBCT when it is going to answer a question that cannot be answered by other methods involving less, or no, radiation.

**When we use CBCT, we should never just “press the button” using a standard exposure for everyone, but we should adjust the exposure factors to a level that gives adequate image quality and use the smallest appropriate field of view.** These simple steps will reassure our patients that we have their best interests at heart; that is what we really want— isn’t it?

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**Will it be possible to grow a tooth in the future?**

By Irma Thesleff, Finland

**While fish and reptiles can renew their teeth continuously, human beings have lost this capacity through evolution. However, people have been dreaming about the possibility of growing new teeth for hundreds of years. These hopes 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 is now taking up 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. We now know the key features of the mechanism of tooth development.

**The remarkable progress in stem cell biology is now feeding hopes of growing new teeth. Cur-**

rency, the most realistic scenarios for tooth regeneration involve the generation of teeth from stem cells with the capability to form teeth. The technology would be based on traditional experiments that demonstrated more than 40 years ago that proper teeth form when separated epithelial and mesenchymal tissues from mouse embryonic tooth germs are recombined and cultured as transplants. Recently, several experiments were repeated by first disaggregating the tissues into single cells before recombination. Thus, dental cells from embryos display the capacity to reorganise themselves into a proper tooth organ.

**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. There is active research in many laboratories addressing the question of how to program stem and progenitor cells to form tooth-specific cifu.

In addition, there are several other remaining challenges such as the issues of tooth 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.
Time pressure, stress at work and their impact on failure occurrence

By Dr René Amalberti, France

Let me introduce you to Dr John David, a dentist in a town of 15,000 residents. John is the only dentist who opens on Saturday mornings and, therefore, his waiting room is packed. At 9:30, Peter S. calls John to get an immediate appointment for a very painful tooth. John apologises and explains that he is totally overbooked. However, the patient insists and so John gives him an appointment for 11:00. A medical examination of Peter shows pulpitis of tooth #27 and despite time pressure, John intends to perform a pulpectomy, which he does extremely quickly within ten minutes instead of the 20 to 30 minutes usually needed. John concludes the treatment with a classic root-canal filling. Unfortunately, he makes a mistake in predicting the correct length of the root, and pushes the root-canal filling much too far, invading the proximal sinus. He recognises the problem on the control X-ray but it is already too late. Peter will suffer from chronic sinusitis owing to the error, and need corrective surgery. He decides to sue the John.

Like the dentist in our example, all dentists are subject to time constants and time constraints. They are confronted with uncertainties, particularly because of their partial control of the situation. These uncertainties add significant risks to the basic yet complex nature of the task. On the one hand, time is encoded in the representation of the activity, and tasks are organised according to time. Dentists usually use deadlines as milestones around which shared activities can be organised. The high number of these deadlines is sometimes misleading because, in most cases, they manage parallel time scales extremely well, and use them as natural markers to distribute their activities throughout the day.

On the other hand, time is what drives transformation in the world; it has its own problem- and error-solving potential. Situations are dynamic and, therefore, a problem encountered at one moment in time will not be the same as another encountered later. Sometimes, not doing anything is the best way to solve problems.

Time also changes situations. As information and disease stack up over time, a complex problem can turn into a much simpler one. Human beings are well aware of this, and often exploit this property of time. For better or worse, dentists have a good grasp of what gaps they can fill; therefore, they can afford to make decisions that they know are not ideal, as long as they believe that this decision will not place them in a situation that exceeds their levels of expertise and fatigue.

Error control usually follows this route. Time is a precious error-detection tool and often helps to alleviate consequences of errors, but it is also the source of many errors in dynamic-situation control. More than 60 per cent of errors are clearly connected to the quality of time control in medicine.

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In dental practice, there is more than one time aspect to manage. Each can be termed a “tempo” and relates to a specific time-related aspect of risk. The skill of the dentist lies not only in controlling each tempo, but also in managing the five tempos simultaneously and in a consistent manner. It has been demonstrated that poor control of one or more of these tempos may result in poor quality of care and an adverse outcome.

**Deficiencies in knowledge and skill**

This tempo typically relates to timely activation of the correct competencies of care. External peer evaluations consider that many errors in patient examination, deficiency in investigation, or undertaking procedures indicate a deficiency in knowledge and skills. But it is not that simple. These errors often relate to a deficiency in the contextual activation of knowledge rather than the absence of knowledge. In many cases, dentists misinterpret a situation and then adopt a strategy, but may change their mind, proving that it was not a matter of total absence of knowledge but of incorrect contextual triggers for timely activation of the correct plan and pattern.

This echoes the distinction made by ergonomics between competence and performance models. The competence model refers to the knowledge owned by the professional; the performance model refers to the contextual activation of this knowledge to carry out the job here and now.

**Time is a precious error-detection tool and often helps to alleviate consequences of errors, but it is also the source of many errors in dynamic-situation control.**

### Surgical factors that influence the aesthetic treatment outcome, including surgical management of aesthetic complications

**By Dr Stephen Chen, Australia**

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.

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 primate 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 maybe associated with adverse soft-tissue outcomes, including loss of papillae and recession of the midfacial mucosa. Facial malposition can be a risk with immediate implants placed into extractions 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.

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 property 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.