# Geistlich Biomaterials NEWS

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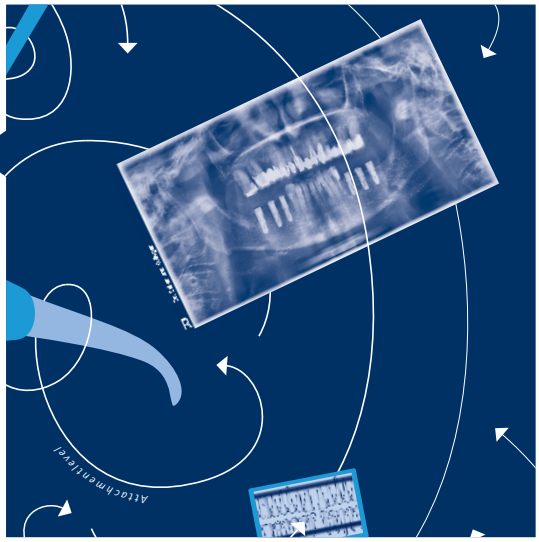
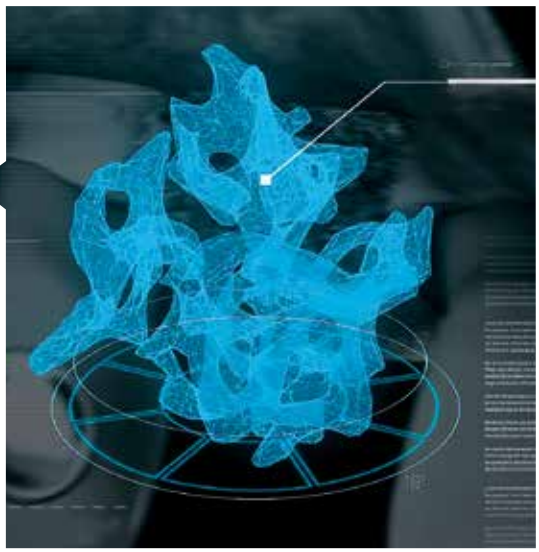
# LEADING REGENERATION

# Issue 2 | 2016







# Back to the 80s...


Dear Readers

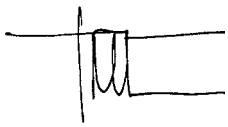
> “No worries, no losing sleep with Geistlich Bio-Oss® and Geistlich Bio-Gide®. Thank you!”.
>
> Ki-Tae Koo | Korea

Geistlich Pharma is delighted to have received favourable comments like this, and many more, from our clients on the occasion of our triple jubilee: 20 years of Geistlich Bio-Gide®, 30 years of Geistlich Bio-Oss® and 1,000 Geistlich product studies. We take great pride in these endorsements, as they are a gratifying reward for our continuous effort to provide the highest quality.

In this issue of Geistlich News we are also focusing on diagnostics and case planning. Our authors report on the latest scientific discoveries and insights. As pioneers in the field of dentistry, we are fascinated by the new possibilities provided us today with, for example, digital planning tools. Sophisticated methods mean you can more effectively avoid complications such as peri-implantitis. Our experts are here to help you with lots of tips on how to plan regenerative procedures correctly (in the “Focus” section) and to guide you through what’s important when communicating with patients.

Our authors have also been looking to the past and have presented us with portrait photos taken in 1986 on the occasion of our anniversary. I would like to thank them for this original touch, and I’ve taken inspiration from them: and so, I present myself to you with a new, younger look.

I hope that you all find this issue of Geistlich News entertaining and enlightening!



Paul Note
CEO Geistlich Pharma AG

# PLANNED PROCEDURE.

What should you watch out for when planning regenerative interventions? And which tools are helpful?

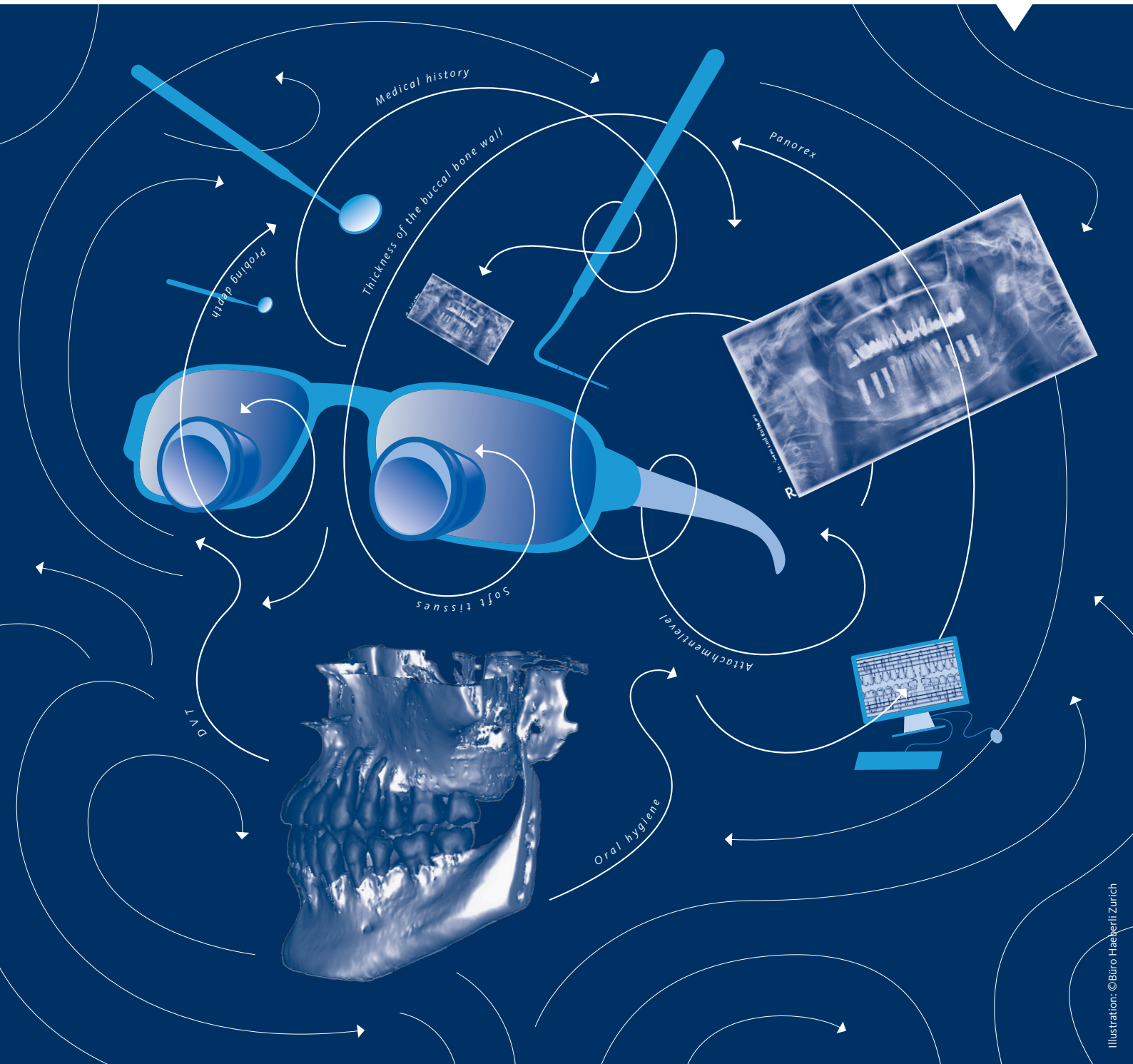



Illustration: ©Büro Haeberli Zurich

# 3-D imaging in the context of treatment planning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## 3-D imaging has revolutionised pre-treatment case analysis and treatment planning.

Cone beam computed tomography (CBCT) is becoming the emerging standard of care for diagnostics.[1] This article focuses on the benefits of CBCT in the context of "restorative leadership" in implant therapy. It also addresses the role of CBCT imaging in interdisciplinary dentofacial therapy for skeletally mature patients requiring orthodontic therapy.

## CBCT and "restorative leadership"

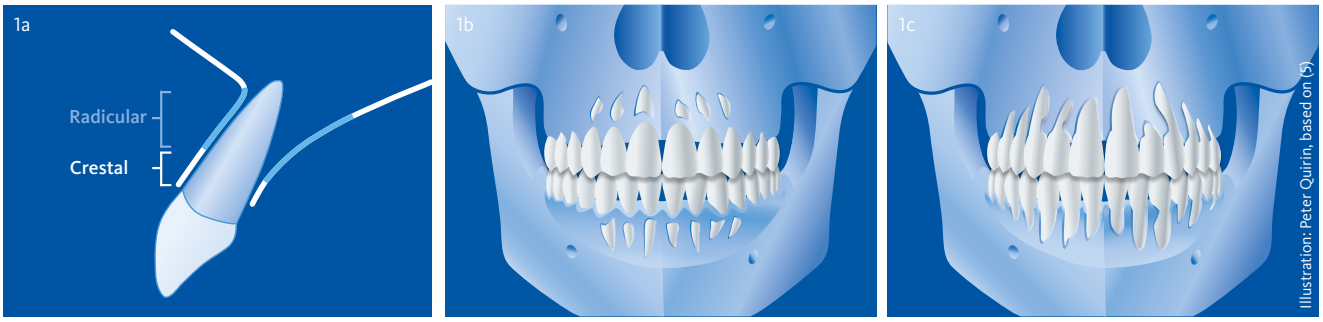
CBCT increases the amount of pre-operative information related to "condition" and "position" of regional anatomy and key structures. It provides valuable information on alveolar bone volume and shape as well as vital landmarks such as the inferior alveolar nerve or maxillary sinus, which cannot be interpreted to anywhere near the same level of accuracy when 2-D imaging is used. Unfortunately, without "restorative leadership" – in other words: without a "prosthetically driven treatment approach incorporated into the 3-D planning software" – meaningful 3-D imaging data interpretation will fall short of its true interdisciplinary potential.[1] "Restorative leadership" means that the prosthetic outcome of implant treatment determines the surgical requirements, which the implant surgeon is expected to follow and and to which he is accountable. It also provides a platform for realistic outcome expectations to be discussed among the treatment team prior to irreversible intervention. Inherent to this interdisciplinary process, the restorative specialist or prosthodontist must assume the key leadership role by determining the outcome goals of the case from a prosthetic, occlusal, facial esthetic and airway perspective.[2] CBCT together with planning software can form a reliable basis for interdisciplinary collaboration.

The diagnostic wax up/set ups, which are incorporated into the CBCT imaging, allow meaningful treatment planning to include the shape and contour of the teeth, the emergence form of the teeth and gingiva and the volume and appearance of the soft tissue. On the basis of Mecall's proposed case type patterns[3], five different treatment planning modalities can be distinguished.[1] In all cases, the wax-up is either the basis for a scanning appliance from radiopaque material, which the patient wears while the CBCT imaging is performed, or, more contemporarily, the wax-up (tooth form or fully contoured) is duplicated into a stone-cast, which is optically scanned and combined with the patient's CBCT image dataset into the planning software.

## The five case type patterns in implantology

**Case type pattern I:** The patient's dental and surgical anatomies are within normal limits. Teeth can be replaced without modifying the surrounding bone or soft tissue. In other words, the pink esthetics are acceptable, and the white esthetics alone require modification. The diagnostic wax-up in this case involves the missing tooth alone (or not, such as in the case of an immediate extraction and implant placement where the white and pink esthetics are ideal). Information from the wax-up is either used for fabrication of a scanning appliance, or the wax-up is optically scanned and merged into the virtual 3-D plan.

**Case type pattern II:** The dental anatomy is sufficient, but there are minor augmentation needs to the surgical anatomy (bone or soft tissue), e.g.,




1a) Crestal and radicular dentoalveolar zone

1b) Thick/thin phenotype with a thick crestal and a thin radicular zone

1c) Thin/thin phenotype with a thin crestal and a thin radicular zone

because of slight facial bone loss, gingival asymmetry, etc. In some cases, such as contour deficiencies, the wax-up has to be fully contoured (replace teeth and soft-tissue). This information is included in the virtual 3-D planning. If the phenotype is spatially and volumetrically correct, a tooth-form wax-up may suffice.

**Case type pattern III:** These cases are situations of primary horizontal bone loss with some vertical change. The patient's dental anatomy is within the normal limits, but the surgical anatomy (bone or soft-tissue) requires primarily lateral ridge augmentation. A full contour wax-up is required, which, after being transferred to the 3-D image, helps to identify appropriate surgical and prosthetic options, including bone or soft-tissue augmentation.

**Case type pattern IV:** Modification of both the dental and surgical anatomy is needed, because of vertical and horizontal bone loss, supraeruption, altered occlusal vertical dimension, etc. A full contoured wax-up is required and possibly even a trial tooth set-up, depending on the extent of partial edentulism and intermaxillary conditions. These cases generally present with primary vertical bone loss and some degree of horizontal atrophy.

**Case type pattern V:** The patient suffers from significant dental and anatomic shortcomings such as an atrophic, completely edentulous ridge. A trial tooth set-up is needed, as the patient may lack adequate tooth and lip support to determine the correct occlusal vertical dimension, phonetics and esthetic outcome goals. In these cases, advanced horizontal and vertical bone loss patterns are evident. In the case of an existing well-fitting denture and prosthodontic parameters acceptable, the denture may either be duplicated into a barium differential gradient (teeth vs. soft tissue) scanning appliance or, as is more contemporary, be used as part of a dual-scan imaging technique.

The CBCT-based virtual treatment plan can be transferred to "real-life surgery" via computer-generated stereolithographic drilling guides or through dynamic surgical navigation[5]. This approach has the potential to reduce intraoperative error. Meanwhile, several levels of control can be distinguished – from virtual planning with CBCT in combination with a conventional surgical guide, to a fully guided approach, where the drilling guide fully determines the apico-coronal, buccolingual and mesiodistal orientation of the implant. Certainly, the more control the computer-generated surgical guide is entrusted for final implant position, the more important accurate clinical and prosthetic planning becomes. Guided surgery can be "accurately accurate" or "accurately inaccurate.". Limited bone volume, higher anatomical risk, multiple implants, flapless surgical intervention and aesthetically demanding situations require precision and accuracy at each step to limit error.

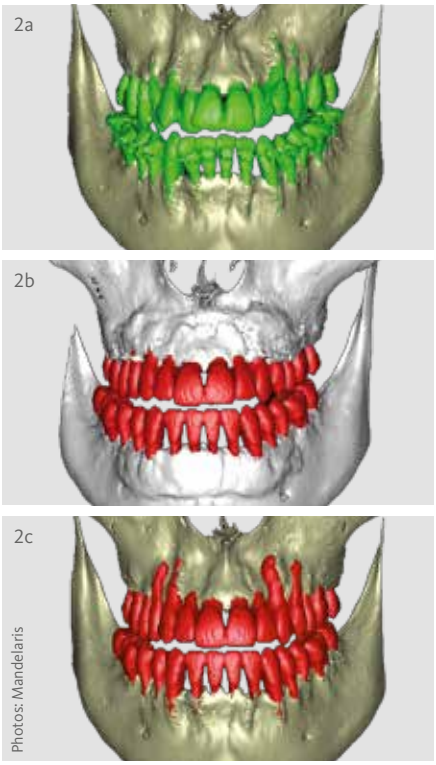
## A CBCT-based classification of dentoalveolar bone

In the context of orthodontic treatment for skeletally mature patients, evaluation of the dentoalveolar bone thickness in both the crestal and the radicular zone can be crucial to minimize the risk for iatrogenic sequelae. According to a CBCT imaging study evaluating nearly 500 patients, average facial bone thickness was determined to be less than 1 mm in 90 % of the patients evaluated (maxillary first molar to maxillary first molar)[4] – underscoring the vulnerability and limitations of the periodontium to certain tooth movements.

In 2013, we published a CBCT-based classification system which categorizes crestal and radicular dentoalveolar bone and helps establish risk prior to interdisciplinary dentofacial therapy cases involving tooth movement.[5] The system defines two zones (crestal and radicular) and describes four different dentoalveolar bone phenotypes [thick (>1mm) or thin (<1mm) by classifying bone thickness in each zone **(fig. 1)**[5]:

› a thick crestal zone and a thick radicular zone
› a thin crestal zone and a thick radicular zone
› a thick crestal zone and a thin radicular zone
› a thin crestal zone and a thin radicular zone

The use of this classification system allows a risk assessment to occur prior to orthodontic tooth movement and can help with the decision as to whether the patient is a candidate for conventional orthodontic therapy or whether alternative orthodontic approaches, such as surgically facilitated orthodontic therapy (SFOT), should be considered.




2a) CBCT showing the pre-treatment tooth position and thin facial bone

2b) Final tooth position and bone volume after surgically facilitated orthodontic therapy

2c) Virtual experiment: combination of the patient's pre-treatment bone anatomy and post-orthodontic tooth positioning (illustrating the loss of both facial bone and iatrogenic sequela that would likely have occurred with a conventional orthodontic therapy)

## What is surgically facilitated orthodontic treatment?

It is well known that moving teeth outside the "orthodontic walls" leads to loss of alveolar bone and increases the risk for iatrogenic sequela.[6] However, in the management of malocclusions with dentoalveolar bone deficiencies, leaving the teeth inside the native bone envelope can mean that permanent teeth have to be extracted in order to gain space and correct arch forms.

Retractive orthodontic schemes to correct the crowded/constricted arch form may induce other problems such as alveolar bone loss and/or result in a net loss of oral cavity volume, which is counterproductive for anterior tongue posturing.[7]

Surgically facilitated orthodontic therapy enables management of crowding and dentoalveolar bone deficiencies by arch expansion (vs. retraction), which enhances the orthodontic walls through bone grafting **(fig. 2).** This approach allows orthodontic decompensations to occur for optimal facial aesthetics and function as well as optimization of anterior protected articulation parameters and improvement of oral cavity volume (which may have a positive effect on measureable airway parameters during sleep, such as oxygen saturation, baseline drift, RDI/AHI, cycling time (%) and heart rate). Corticotomy based SFOT surgery involves corticotomies and dentoalveolar bone decortication as well as bone augmentation to enhance the orthodontic walls.[8,9] It is periodontal ligament mediated and dependent.

## CBCT for informed consent

Perhaps the least appreciated benefit of CBCT imaging is the ability to consult with a patient in an atmosphere of complete disclosure. Informed consent becomes more transparent, and the playing field for accountability is level, because the same information for analysis and treatment planning is available for all participating team members. Additionally, we use CBCT in our practice for getting the patient involved in a "co-discovery" approach to their problems and concerns. Educated patients will generally make the best health care decisions after understanding all options.

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# Immediate implant placement: Case selection is key

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Melbourne Periodontal Specialists
Clinical Associate Professor at The School of Dentistry
University of Melbourne


Stephen Chen in the 80s

Thick gingivae, an intact facial bone wall, sufficient bone volume on the apical aspect, no infection – many things have to be considered before placing an implant immediately. A brief guide for everyday practice.

The concept of placing immediate implants into fresh extraction sockets has been around for a long time.[1,2] After all, extraction sockets will usually heal spontaneously with bone regeneration in the socket and new mucosa over the socket entrance. So it has always seemed a reasonable proposition that the bone will also fill in around an implant that has been placed into a socket at the time of extraction.
Paolontonio (2001) provided human histologic evidence of this when experimental implants were placed into maxillary extraction sockets.[3] The authors found that if the distance between the implant and the socket wall was 2 mm or less, the bone would regenerate completely. This led to clinicians enthusiastically embracing the concept of immediate implants, with an assumption that a "jumping gap" of 2 mm or less would fill with bone spontaneously.

## Immediate implant placement and bone resorption

Today we realize that this assumption was made without consideration of other aspects of socket healing that we now understand. Araüjo and co-workers demonstrated that when a tooth is removed, the bundle bone that lines the socket resorbs completely.[4] In most tooth sockets, the facial plate is thin in the coronal region and is mostly (if not entirely) made up of bundle bone. Resorption of the bundle bone is accompanied by loss and diminution of the height and width of the facial bone crest.[5]
If an implant is placed into a socket at the time of extraction, the facial wall will resorb and reduce the regenerative capacity of the socket. This will happen to some extent even if a bone graft is placed to fill the marginal gaps.[6] Clinically this is seen as incomplete bone regeneration at the neck of the implant with the formation of a dehiscence. This risk includes thinning and recession of the mid-facial mucosa. A number of systematic reviews have reported that immediate implant placement is associated with a significant risk of soft-tissue recession.[7–9] In one review, the frequency of recession of 1 mm or more ranged from 8.7 to 40.5 %.[9] Furthermore, if the facial bone resorbs, there is a risk of biofilm contamination of the exposed implant surface and subsequent inflammation of the peri-implant mucosa. The extent of the resorption of the facial bone is dependent on the thickness of the facial bone.[10] If the facial bone is thin (< 1 mm), it resorbs 3 times more than if the facial bone is thick (≥ 1 mm).[11] Thus, clinicians should identify thick bone phenotypes to reduce the risk of mucosal recession and increase the chances of successful bone regeneration in the marginal peri-implant defect.

## Diagnostic measures

What diagnostic information is required to properly assess a case for immediate implant placement? The ideal situation for placing an immediate implant is when the soft tissue phenotype is thick with no gingival recession, the facial bone of the socket is both thick and intact, there is absence of acute infection and there is sufficient bone apical to the socket for implant stability.[12] The first step is the clinical

examination. The patient needs to be periodontally healthy with sufficient plaque control and motivated to maintain oral health. If the gingiva is inflamed, implant treatment should be deferred until inflammation is controlled and the patient is performing oral hygiene at the required level.

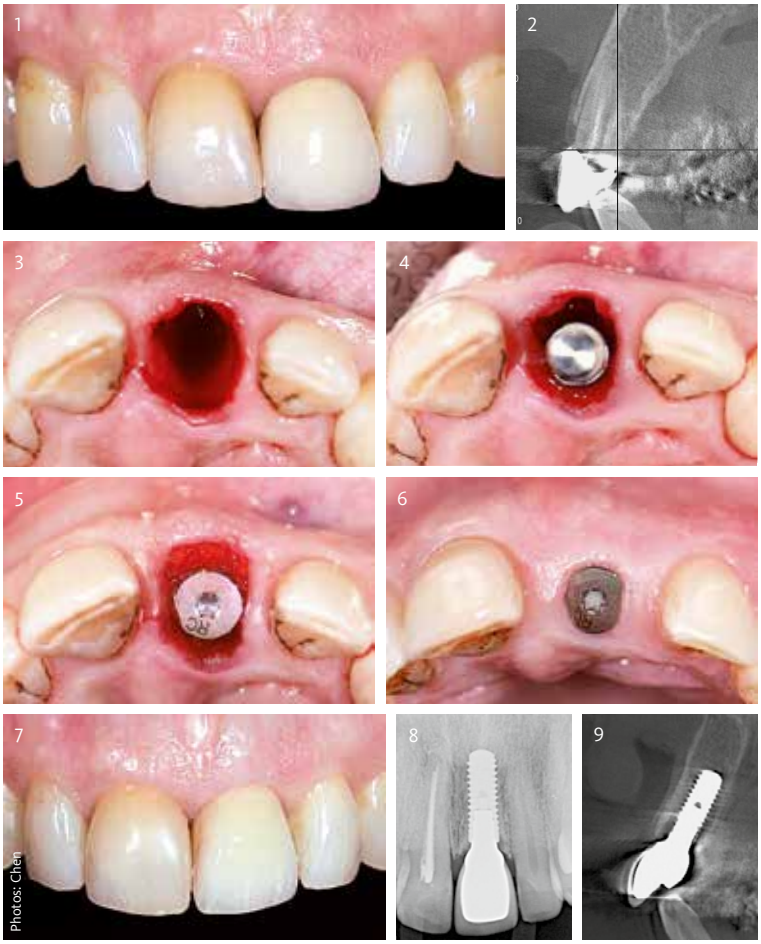
At the proposed implant site, the soft tissues can be evaluated by visual inspection and the use of a periodontal probe. Thick gingiva can usually be determined by simply looking at the soft tissues **(fig 1)**. Another way of looking at the soft tissue thickness is with a periodontal probe placed into the gingival sulcus.[13] If the metal of the probe is not visible through the soft tissues, then the gingiva can be regarded as thick. Clinicians should note that this is not an exact procedure and prone to error.

Further evaluation can be done with cone beam CT (CBCT) examination, which will be explained later. In relation to the condition of the facial bone wall, careful probing with a periodontal probe will determine whether the bone wall is intact or not. With intact bone, probing pockets should be shallow, ranging from 1 to 3 mm. If there are deep pockets present, this indicates damage to the facial bone and the presence of a dehiscence defect.

The clinician should also look for draining fistulae, which would indicate active periapical pathology and a fenestration of the facial bone. The history of the tooth can also provide clues as to the condition of the facial bone. If an apicectomy has been performed, then there is a good chance that part of the facial bone is missing in the region of the apicoectomy. Plain film radiography (periapical or panoramic radiograph) is an important diagnostic tool to determine the presence or absence of apical pathology and whether there is likely to be sufficient bone to stabilise the implant.

If the clinical signs indicate a favourable situation, i.e., healthy and thick soft tissues, intact facial bone and sufficient apical bone to place an implant, then the next step is to obtain a 3-D image of the site. Today, CBCT provides a convenient way of obtain-

**CASE**




1 The crown of the maxillary left central incisor has fractured. The gingival phenotype is thick. In addition, the gingival margin is more coronal to that of the adjacent central incisor, a favourable situation for immediate implant placement.

2 A CBCT view of the maxillary left central incisor. The facial bone is 1 mm thick.

3 The tooth has been extracted without elevation of a flap. The walls of the socket can be inspected directly and with the use of a periodontal probe to ensure that all bone walls are intact.

4 The implant has been placed without flap elevation into an ideal 3-D position.

5 The implant shoulder has been positioned approximately 0.5 mm apical to the facial bone crest. The marginal gap has been grafted with Geistlich Bio-Oss® to the level of the facial bone crest. The collagen matrix Geistlich Mucograft® Seal has been inserted into the gap between the healing abutment and the gingiva.

6 After 10 weeks of healing, the soft tissues healed uneventfully and were healthy.

7–9 At the two-year recall, the peri-implant tissues were healthy and the radiograph and CBCT showed ideal bone conditions and stable crestal bone at the neck of the implant plus the maintenance of a thick facial bone wall with the bone crest located coronal to the implant abutment interface.

ing 3-D images for implant treatment planning **(fig 2)**. Depending upon the site, the lips and/or cheeks should be retracted with plastic retractors or cotton wool rolls. This creates an air space between the lips and cheeks and the alveolar process that can help provide a clear view of the facial bone and gingiva.[14] The thickness of both the facial bone and soft tissues can be determined with this approach. Additionally, the presence or absence of apical pathology can be confirmed once again and the apical bone assessed to ensure that an implant can be placed in the correct 3-D position with stability.

CBCT imaging data can be combined with planning software programs to accurately determine the correct position for implant placement. The planned position can then be transferred to a surgical template to assist with implant positioning during surgery.

## Surgical treatment

From the previous discussion, it is clear that immediate implant placement is a planned procedure and not something that should be done spontaneously without the proper pretreatment diagnostic steps. With good planning, it is almost always possible to proceed with immediate implant placement unless complications occur as a consequence of the tooth extraction. If the root is ankylosed or part of the facial plate is damaged as a result of the extraction, then the implant placement may need to be delayed until additional healing has taken place. The extraction should be done carefully with fine luxators and root forceps.

Once the tooth has been extracted, the internal part of the socket should be carefully examined visually and with the use of a periodontal probe to look for defects and bony contours. The extraction should be done without flap elevation to reduce surgical trauma **(fig 3)**. This will also allow subsequent placement of the implant without a flap being raised to minimize surgical trauma.[15]

A surgical guide is recommended to ensure that the implant is placed in the correct three-dimensional position **(fig 4)**. Due to the dense bone on the lingual aspect of the socket, there is a risk that the implant could deflect towards the facial side when it is inserted. This malposition can result in recession of the facial bone wall. The implant should be placed with the shoulder approximately 0.5 to 1 mm apical to the facial bone crest to compensate for the resorption that will occur. If the implant is placed correctly, a marginal gap of at least 2 mm will be present between the implant and the internal aspect of the facial wall. This marginal defect should be grafted with a bone substitute that has a low replacement rate, such as deproteinised bovine bone mineral (DBBM) **(fig 5)**. Once the implant has been placed, the clinician has the option of attaching an immediate restoration to the implant. If this is done, care needs to be taken not to disturb the DBBM graft and to minimize the risk of bacterial contamination.

## Alternatives to immediate implant placement

When conditions are not ideal for immediate implant placement, early implant placement with either soft tissue healing (type 2 according to ITI TReatment Guide[16]) or partial bone healing (type 3) should be performed instead. What are these non-ideal conditions? From the previous discussion, soft tissue inflammation, the presence of acute infection, thin facial bone, damaged facial bone and lack of apical bone to anchor the implant would rule out an immediate implant approach. If there are extended defects, such as large periapical lesions or apical cysts, immediate implants are generally contraindicated.

Care should also be taken with multi-rooted tooth sockets. Whilst it is possible to place immediate implants into multi-rooted sockets, this should only be undertaken by clinicians who are very experienced with this approach. A much safer approach is to allow the socket to heal with partial bone regeneration over a period of 12 to 14 weeks (type 3 approach). The implant can then be placed in a good 3-D position and with good stability. The marginal defects become much smaller because of the spontaneous bone healing, often only requiring minor grafting to fill residual defects.

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# Planning bone reconstruction: “Understanding the connections”

**Dr. Ueli Grunder | Switzerland**
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Interview by Verena Vermeulen


Anyone planning bone regeneration should never just follow a rigid decision tree, but focus instead on the most important connections and factors.

Dr. Grunder, in what kinds of cases would you plan for a bone augmentation as a two-stage procedure?

**Dr. Grunder:** On the one hand, it depends on the remaining volume of bone – is there enough to anchor the implant for primary stability? While, on the other hand, the defect and its environment must allow a risk-free placement of a dimensionally stable membrane, which I can use for larger-scale bone augmentations. If one of these two conditions is not present, then I’d prefer to take a two-stage approach.

And otherwise you’d take a one-stage approach?

**Dr. Grunder:** Yes. The one-stage procedure saves both time and money, and you achieve your objective with one less operation. It’s clearly preferable.

What planning criteria play a role?

**Dr. Grunder:** First of all, one should be aware of what’s required for the final result. What level of outlay is or should be required? In the aesthetic field a higher level of outlay is generally justified. The reason being that you need to assess the bone defect both horizontally and vertically, and – what’s especially important – you have to make a judgement about the attachment level of the neighbouring teeth. An accurate perio score is vital for this.

Do you routinely take CBCT images to assess the bone?

**Dr. Grunder:** No, in only about 10 percent of cases. For example, if I have to explain to a patient why I am going to use a one- or two-stage procedure. But the bone situation is best judged after surgically exposing the site.

So do you sometimes only make the decision during the operation?

**Dr. Grunder:** Yes, that does happen. But it can also be the case even when CBCT images are available that, for example, an entirely local loss of attachment to the neighbouring teeth is revealed only during surgery. This can be underestimated with CBCT images. You should always leave yourself the freedom to make decisions during the operation, and you should also keep the patient informed.

Do you find that routine use of CBCT is excessive?

**Dr. Grunder:** CBCT is a great teaching aid, and it can be really useful for a beginner. But an experienced clinician doesn’t necessarily need CBCT information. You should only take a CBCT image if it’s going to give you extra vital information that can make a difference to the treatment. I find that taking CBCTs before a tooth extraction is essentially useless for a subsequent implantation.

What’s your basic approach when planning an augmentation?

**Dr. Grunder:** The most important thing is the prosthetic planning. It is critical for where the implant will eventually be placed and, from an aesthetic point of view, where the bone and soft tissue have to be. A surgical template can be useful for planning. It should determine not only the position and orientation of the implant but in the aesthetic zone it should also take into consideration the desired soft tissue development for crowns. This is known as the emergence profile. It lets you plan how much bone must be augmented vertically and horizontally, so that from an aesthetic viewpoint you will have sufficient volume in the end. In the case of several implants next to

each other, the prosthetic plan must also include information about the required contact point between two neighbouring implant crowns. This will help to clarify to what extent the bone must be built up vertically, so that in the end a papilla will fill the interproximal space properly.

Soft tissue can be a critical factor. What do you have to be aware of when planning a bone augmentation?

**Dr. Grunder:** What's critical is whether the soft tissue can be sutured perfectly and without tension at the end of the operation. The seal must remain intact for months.
Scarring, very thin or imperfectly healed soft tissue and insufficiently keratinised mucosa can interfere with soft tissue management. This means that you have to eliminate scarring before augmenting the bone, which can be very difficult. You can also thicken thin soft tissue with a connective tissue transplant and obtain a keratinised mucosa with a free gingival graft, although aesthetically it is very undesirable because of the change in colour. If an extraction socket has still not healed properly, you sometimes just have to wait before you can insert the implant.

For bone augmentation, what determines your selection of materials?

**Dr. Grunder:** It depends on the answers to two key questions: how much volume stability is needed? And how long will it take for the bone to regenerate?

And on what does volume stability depend?

**Dr. Grunder:** How much volume stability the material has to have depends on whether I'm only filling in a defect, which is surrounded by existing bone, or if I'm creating new bone in the sense that it's a *de novo* construction of bone. If it only involves filling in a defect surrounded by bone, you can use materials which are not volume-stable, because in these cases the bony environment already provides the necessary stability. In such cases I use bone replacement material in granular form, for instance, and a resorbable collagen membrane. In the case of *de novo* bone formation – for example, for larger horizontal and vertical defects – the filling material or membrane must be volume-stable, but at the same time easily adaptable, as this is the only way to build up a perfect contour.

**Is there sufficient stability? Do you have enough information?**

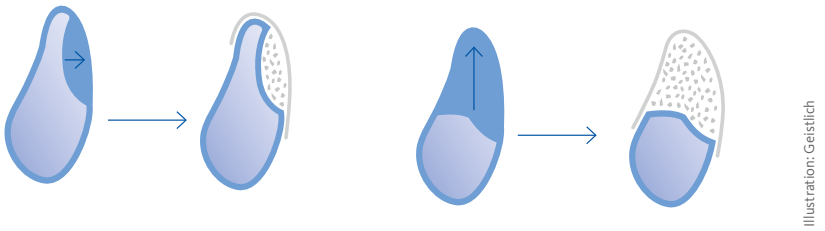

Illustration: Geistlich

And on what does the second factor, the speed of bone regeneration, depend?

**Dr. Grunder:** If it is a four-wall defect, for example, the regenerative capacity comes from the existing four bony walls. This allows a relatively rapid formation of new bone, and it is enough if the membrane inhibits ingrowth of soft tissue for just a few weeks. Single-walled defects, on the other hand, regenerate slowly. You can either accelerate this process by mixing autologous bone chips in with the bone replacement material, or you can use a membrane with a long-lasting barrier function. Such membranes are frequently not resorbable, however, and they have to be removed later on.

What materials do you select if you are reconstructing large bone defects, and you need a dimensionally stable material?

**Dr. Grunder:** I don't like using autologous bone blocks because they resorb. But if volume stability is required, I choose a dimensionally stable, non-resorbable, titanium-reinforced membrane, and under it I use either a mixture of Geistlich Bio-Oss® and autologous bone chips, or, more frequently, just Geistlich Bio-Oss® Collagen.

Do you have a decision tree for bone regenerations that you always use?

**Dr. Grunder:** I take a very critical view of decision trees. A decision tree gives users the feeling of being able to reach the right decision based on simple criteria, while in actual fact, numerous factors come into play. A rigid decision tree can mean you miss certain details and select the wrong procedure. I would advise that you always keep your focus on which factors play what roles and understand these relationships. Using a decision tree in no way insures that you have really understood all the issues involved.

# Communication is part of the cure

**Dr. Michele Rossini, Dr. Francesca Rossini | Italy**
Rossini Dental Practice
Como

The interview was conducted by Dr. Laura Fedrizzi


For patients, an edentulous area is a "gap;" the word "bone" makes people feel uncomfortable; and the word "surgery" in the context of dentistry creates confusion. What is important when explaining a dental treatment to patients?

Dr. Rossini, what is the key in gaining the patients' long-term confidence?

**Dr. M. Rossini:** Certainly, consistency is. It is hard to do all the time, but essential. Our work is based on human and interpersonal contact. Our patients are people who rely on us in an uncomfortable environment and in situations of suffering. The only way we have to deal with this condition in the long run is the confidence that we can inspire. Consistency between what we say, what we do and who we are is the most effective way to build confidence.

What made you realise the crucial importance of communication with the patients in your profession?

**Dr. M. Rossini:** The concept of effective communication is always seen as a non-specific and parallel activity that can improve a doctor's work, but is not really seen as an integral part of what we do.. We consider the communication between doctor and patient as an activity that is truly specific for the profession, replacing the scientific-technical model centred on the disease, with a more human and patient-centred model. The communication between doctors and patients is not only a means to a diagnosis but also becomes a goal in its own right, a goal that allows us to take care of people and not just cure disease.

How important are the patients' wishes? How do you interpret them correctly?

**Dr. F. Rossini:** We are talking about people, not patients; they are like us and have desires, expectations and ideas very similar to those that we would have in the same situation. The focus is on the experience and the relationship with the person. Therefore, good observation and active listening skills are helpful. We should analyse personal data to find out whether our patients are young or old, married or single, of low, medium, or high education, as well as what type of work they do, how far they have to travel to reach the practice, and much more. These analyses provide valuable guidance for establishing communication.

How do you plan a dental treatment?

**Dr. F. Rossini:** We follow the concept of prosthetically driven implant placement. Digital technologies have enabled us to merge the STL files generated by intra-oral scanning with DICOM files from cone-beam examinations to provide information on the bone tissue. This combination of data allows us to plan patient prosthetic implant surgery from the first to the last step. The surgeon can understand the issues related to the proper design and execution of the restoration and can plan the surgical procedures based on these issues.
We use short and tilted implants, but these may not always be the best solution. The consequence is greater and more focused use of tissue regeneration techniques, which are steadily increasing, if we consider the anterior regions, where they are now mandatory.

In a nutshell, how does your first meeting with the patient go? And how many people accept your treatment proposal?

**Dr. F. Rossini:** I ask 100 questions to understand the patient's needs. Then I have an in-depth consultation between surgeon, prosthodontist and

orthodontist. We know we must all take the time to evaluate the best solution. Our motto is: "one month to decide, one day to do." The patients like the idea that we do not rush things, that we consider their quality of life during treatment, and that we manage the discomfort that can accompany extensive treatment plans. The treatment acceptance rate is high, around 85 %, and even higher if we take advantage of digital pre-visualisation technologies.

What does this mean? How do you explain a treatment to the patient?

**Dr. M. Rossini:** The words and images should be simple and immediate. Technical explanations need to be given, but at the appropriate time and not before you have created a relationship with the patient and,completely understand their needs and expectations.
We did a survey on the terms used with patients: for example, an edentulous area is and should always remain a "gap;" the word "bone" makes people feel uncomfortable; and the word "surgery" creates confusion in the context of dentistry – we are, for our patients, always and only dentists!

Do you have key words that you use?

**Dr. F. Rossini:** I think that metaphors provide good imagery. For example: no one would consider building anything designed to last on an unsound foundation. It is important that the whole team shares an agreed upon and consistent message, from the surgeon to the prosthodontist. Safety, durability, strength and efficiency are commonly understood and shared concepts. I prefer those expressions over technical terms such as "preservation of the alveolar ridge."

Regarding the materials used: what is important for the patient?

**Dr. M. Rossini:** The internet has really changed the situation between dentist and patient. More and more people are turning to the boundless ocean of information on the web before and after the visit in order to enquire and find confirmation.
Mentioning companies that collaborate with our practice and that can be verified by the patient independently on the net is an additional bonus to ensure the effectiveness of long-term communication.

**Talking to the patient – the six steps of "selling" a regenerative treatment**

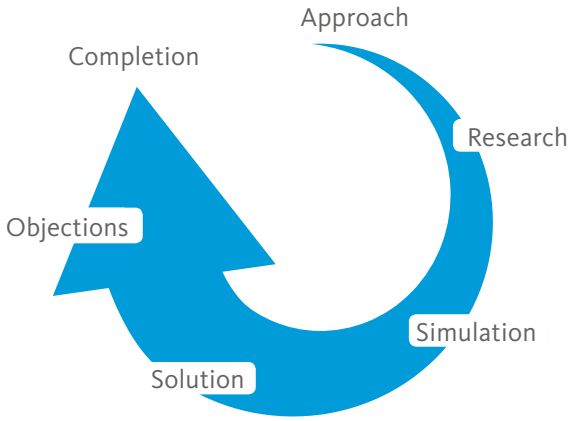


Illustration: Planet

"Our communication allows us to take care of people, not just cure disease."

What is important for patients in the post-surgical phase?

**Dr. F. Rossini:** The phone call on the day before surgery, to make sure that everything is ready, and then in the evening after the intervention are both appreciated by the patient, and useful to us as well. Our voicemail system, which is well-used and always-on, and, most recently, social media, enable us to provide a reliable reference point, given that we treat a large number of patients each week. We are, as they say today, always online, always active and present for any problem.

Have things changed since when you began devoting yourself to good patient communication and today?

**Dr. M. Rossini:** Until a few years ago, change was felt within the span of a generation; now it is perceived within three years. And that goes for everything and everyone. It's best to assume that everything changes, and nothing can be taken for granted. Communication is the matrix that regulates these new dynamics. Communication is faster, includes more people and occurs in a wider sphere. The digital generation, now grown up, likes visual communication. It is essential to know how to create images of health and well-being that engage and attract patients to an idea, a symbol, a message... ideally ours.


# “Risk assessment helps avoid peri-implantitis!”

**Prof. Stefan Renvert | Sweden**
Department of Health Sciences
Kristianstad University
Kristianstad

The interview was conducted by Verena Vermeulen

Thorough diagnosis, patient selection and treatment planning can help decrease peri-implantitis risk. But patient compliance is key.

Prof. Renvert, ten years after implant placement, seven percent of implants are lost and about fifteen percent of patients suffer from peri-implantitis1. Can this be attributed to poor implant placement planning?

**Prof. Renvert:** To attribute all those cases to a failure in treatment planning or placement of implants would be too easy, but I think it is really important to put a greater focus on risk assessment before placing an implant.

Several factors can make an individual susceptible to peri-implantitis. Which correlations have a good evidence-basis?

**Prof. Renvert:** History of periodontitis and bad oral hygiene are definitely related. There are also reasons to believe that smoking has a negative impact, and systemic conditions such as diabetes or cardiovascular disease may play a role. So, when someone suffers from those conditions, it might be necessary to compensate for an increased risk when placing an implant by reducing other risk factors.

A person with poor oral hygiene is reported to be 14 times more prone to develop peri-implantitis, and a person with a history of periodontitis and no maintenance therapy is 11 times more prone. What conclusions can practitioners draw from these numbers?

**Prof. Renvert:** If we place implants in patients with a history of periodontitis, it is crucial to discuss the higher risk for peri-implantitis with them openly and to make it clear that good oral hygiene is needed in order for them to keep their implants. “New teeth for a lifetime” is not realistic without lifting a finger. Additionally, one should definitely reduce risk factors for those patients wherever possible, for example: consider where we place the implant, make it possible to clean the implant properly and urge patients to quit smoking. There are also good reasons to prefer screw-retained over cemented reconstructions in order to reduce the risk for what some people call “cementitis.”

How about the implant surface?

**Prof. Renvert:** This is a difficult question, because there are few animal and human studies. Osseointegration works better on implants with a micro-textured surface, but if such a surface is exposed, it is more prone to retain biofilm.

Is there a risk assessment tool that you would recommend?

**Prof. Renvert:** I recommend focusing on the main points we discussed: history of periodontitis, smoking, oral hygiene, conditions such as diabetes or cardiovascular disease and the patient’s compliance.

Besides susceptibility, there is also the implant placement itself. What can the dentist do to minimize peri-implantitis risk?

**Prof. Renvert:** The correct positioning of the implant is key. This includes optimal placement in the envelope, not angulated in the wrong direction and not too close to neighbouring teeth or implants. And it’s also absolutely crucial to design the prosthesis so that it is possible for the patient to clean it properly. Sometimes we find restorations, even in the posterior lower jaw, that are more aesthetic than functional, although this area is rarely visible when smiling. One should also allow sufficient healing time and be very cautious with infections, for example: remove granulation tissue and refrain from immediate implant placement in infected areas.

Do we have scientific data on the most common treatment mistake that increases the risk for peri-implantitis?

# Risk factors for peri-implantitis

Data presented by Dr. Stephen Chen, Melbourne, April 2016, based on references 2-7

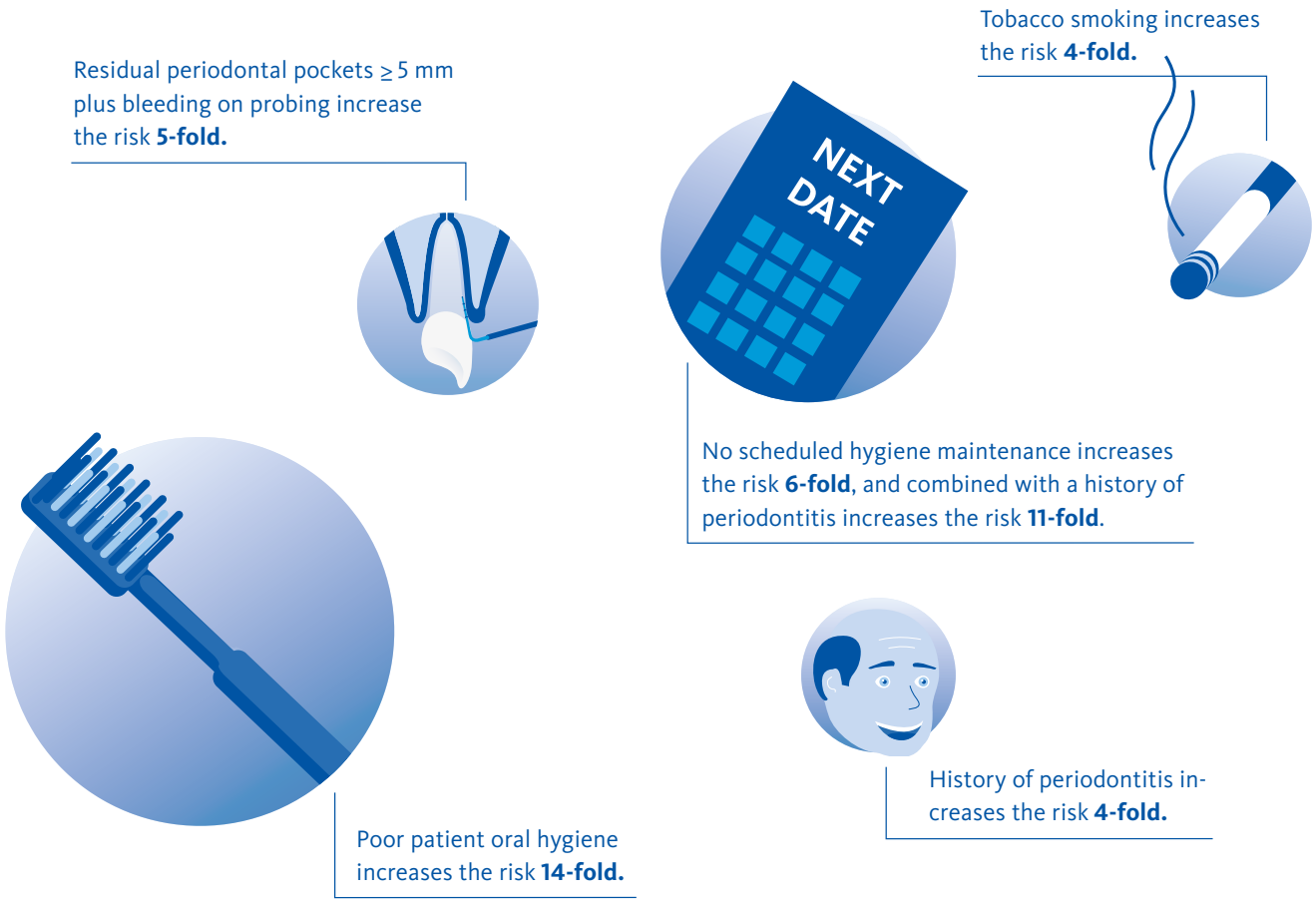


Illustration: Büro Haeberli

**Prof. Renvert:** I do not know of any such data. I guess the most common mistake is a prosthesis that is impossible to clean.

You are one of the world's top experts in peri-implantitis. What is your key message for your colleagues regarding prevention of peri-implantitis?

**Prof. Renvert:** It's kind you call me an expert. But let's put it like this: if I had a private practice I would make a very thorough risk assessment, explain the pros and cons very openly to my patients and urge their participation in the treatment success. The latter includes very good oral hygiene and smoking cessation. In addition, I would design a regular maintenance program, e.g., on a quarterly basis in the first year after implant placement and then two appointments per year, one with a dental hygienist and one for measuring the probing pocket depth, the bleeding on probing, etc. This would let us intervene as early as possible, because peri-implant mucositis is much easier to treat than peri-implantitis.

Are there situations where you would refrain from placing implants?

**Prof. Renvert:** Placing implants in a person with a history of periodontitis and non-compliant with their oral hygiene would be asking for trouble. We have to be very open that this will lead to complications. What all patients want is a healthy smile, and that's also what I want to give them. I don't want to give them peri-implantitis.

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# Case study: alveolar ridge reconstruction with Yxoss CBR®


**Dr. Marcus Seiler | Germany**
Dr. Seiler and Colleagues Clinics
Filderstadt and Kirchheim u.T.
ReOss GmbH
Filderstadt

Yxoss CBR® is a customised titanium grid structure designed for the regeneration of bone defects – based on a patient's CBCT or CT data. It stabilises the graft in the optimal position and can be easily removed later.

The 66-year-old patient presented with periodontal problems, and she requested a restoration of the posterior region of the lower mandible. After extraction of teeth 35, 37, 45 and 47, which were not worth retaining, the bone proved to have a horizontal and vertical volume deficit in both posterior regions.
The bone was augmented using a 1:1 mixture of autologous bone chips (retromolar removal) and Geistlich Bio-Oss®, as well as a titanium scaffold produced specifically for the patient (Yxoss CBR®).
A Geistlich Bio-Gide® collagen membrane shielded the graft from the soft tissue. A dual-sided split-flap permitted a tension-free wound closure and allowed a sufficiently wide keratinised mucosa to form later in the implant area.
After six months, the soft tissue conditions were clinically stable and free of any dehiscences.
A ridge incision from position 5 to 7 was selected for the removal of the grid structure. After loosening the fixing screw, the grid structure could be separated carefully into two parts by applying small extrusion movements to the target breakpoint with a periostal elevator and be removed. The implants (Camlog, Screw Line®) were then inserted into the regions 35, 36, 37 and 45, 46, 47.

## Why was Yxoss CBR® used for the treatment?

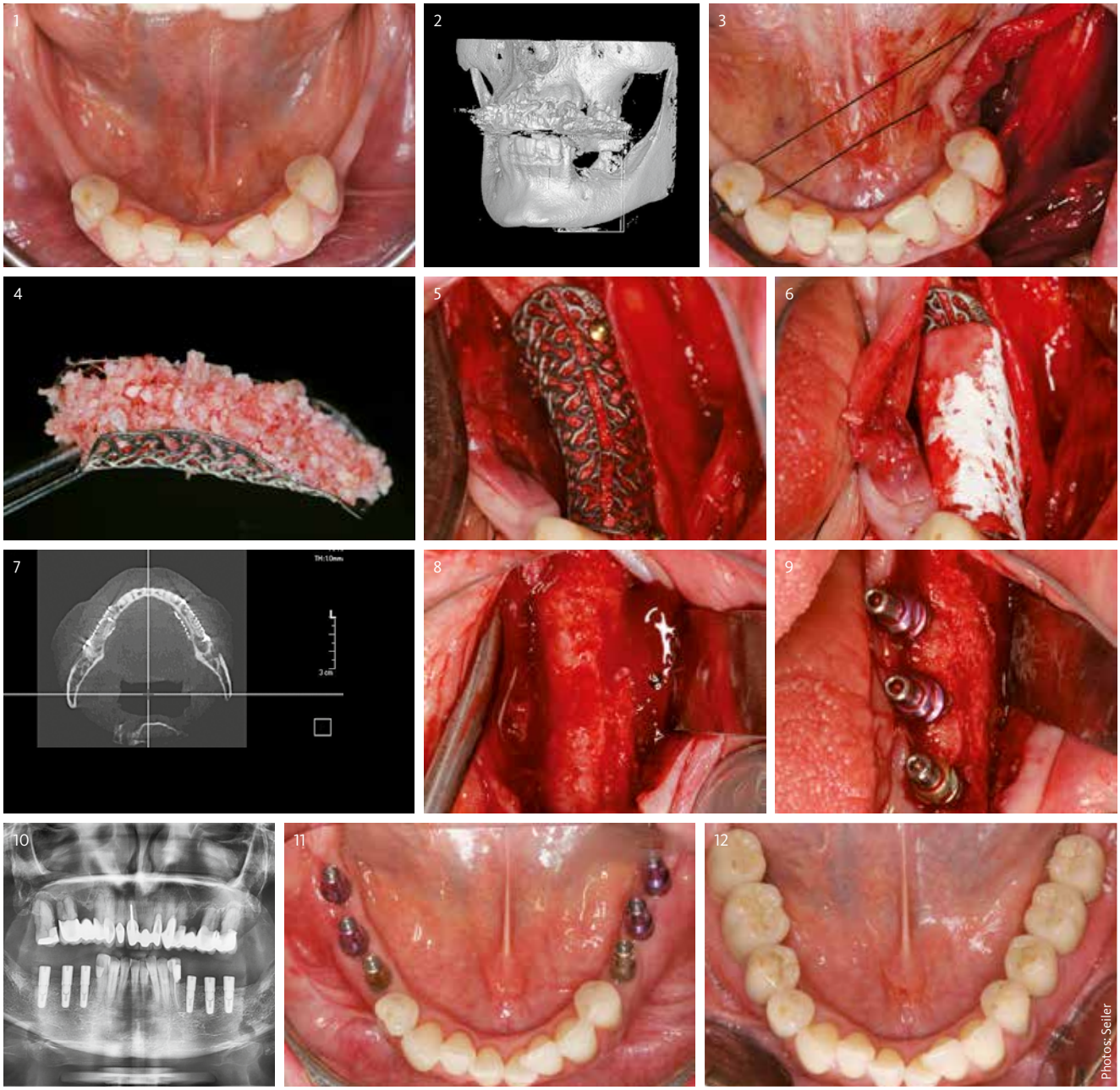
The Yxoss CBR® titanium grid is designed on the basis of CBCT data from the affected region of the jaw, or a cranial CT scan, and it is produced using a CAD/CAM procedure. Fixed onto the extant bone with two titanium screws, it defines the target contour of the regenerated alveolar ridge for later implant insertion, and it stabilises the introduced bone-biomaterial mixture. The use of Yxoss CBR® has various advantages over other treatment alternatives. Because of its individually-designed fit, the shape of the frame does not have to be adapted first to the defect, and this shortens the operation time. Titanium grids do not have sharp edges. This is advantageous for wound healing and helps avoid dehiscences. Yxoss CBR's precisely customisable and dimensionally stable configuration also provides a space for undisturbed bone regeneration.

## You still have to make allowances

For extensive defects it might be necessary to provide longer healing times for complete regeneration.

**Disclaimer:** Dr. Marcus Seiler is the proprietor and CEO of ReOss GmbH, which has developed the product Yxoss CBR®. Products including ReOss technology are marketed by Geistlich Biomaterials in Germany. These products are not yet available in all countries.

**CASE**




1 Transversal contour deficit in the initial clinical situation.

2 Clear transversal deficit in the regions 35–37 and 44–47 in the pre-operative DVT.

3 The surgical area.

4 Geistlich Bio-Oss® and autologous bone in a 1:1 ratio are introduced into the Yxoss CBR® titanium grid.

5 The titanium grid with a fixing screw and the slightly compressed graft material in situ.

6 A Geistlich Bio-Gide® membrane covers the graft.

7 The augmented volume in a transversal CBCT angle.

8 After removal of Yxoss CBR® by applying small extrusion movements to the target breakpoint (Easy Removal®), well-vascularised bone can be seen.

9 Parallel placement of the implants (Camlog® Screw Line, regions 35 and 45 (diameter 3,8 mm / length 11 mm) as well as regions 36, 37 and 46, 47 (respectively diameter 4,3 mm/ length 11 mm).

10 Correct position of implants in the post-operative X-ray.

11 After introduction of the abutment connection.

12 Final situation with the individually separated crowns.

# KEY STUDIES SELECTED.


**Associate Prof. Stephen Wallace | USA**
Columbia University, New York, Private practice in Waterbury, CT

**Assisstant Prof. Tiziano Testori | Italy**
University of Milan, Galeazzi Institute, Milan
Centro Internazionale Implantologia Prof. Testori, Como

# BIOMATERIALS FOR MAXILLARY SINUS AUGMENTATION

**INTRODUCTION**

**The surgical methodology for maxillary sinus augmentation was pioneered in the late 1970's in presentations by Hilt Tatum and in the first publication on this topic by Philip Boyne in 1980.[1] It was performed for a different reason than you would think. The purpose was to allow for a tuberosity reduction to increase the interarch space without encroaching on a pneumatized maxillary sinus, although 3 of the 14 cases were for the purpose of placing blade implants. The grafting material, as you can imagine, was particulated cancellous bone and marrow harvested from the lateral iliac crest.**

**The utilization of extraoral autogenous bone was thus given the jump-start that it needed to become, over the next 15 years, the "gold standard" of grafting material for this procedure. In 1996 Wheeler published on 36 sinus grafts using hydroxyapatite alone or hydroxyapatite as a composite with autogenous bone.[2] The histomorphometric results were quite similar being 16.4 % and 19.3 %, bone by volume respectively. Other clinicians, as well as our faculty at New York University, were seeing similar outcomes with other bone replacement grafts at this time. Certainly, eliminating the increased morbidity of a second surgical site was an advantage for both patients and clinicians. Further, eliminating the dependence on extra oral bone harvesting moved this surgical procedure from the hospital operating room to the dental office. Our research on grafting materials continues at New York University, Columbia University and in Italy.**

## Autogenous bone preferred

It was at this time that the Academy of Osseointegration held its first Sinus Consensus Conference. The results, published in 1998[3], by **Jensen et al.** included a consensus statement that autogenous bone was the preferred grafting material; however, bone replacement grafts could be acceptable in selected cases. This statement was not based on a difference in outcomes but on a difference in the amount of reported data, as cases with a 3-year follow up had to have sinus augmentations performed by 1990–1991, the latest to meet inclusion criteria.

## More favorable results using xenogeneic bone

Developing evidence for bone replacement grafts (xenogeneic, allogeneic, alloplastic) was by this time appearing frequently in our peer-reviewed journals. This led to the publication of a number of systematic reviews that dramatically highlighted the changing perception about bone replacement grafts in sinus augmentation. In 2003 a systematic review by **Wallace and Froum (including 43 studies)** finally broke down the myth of the superiority of autogenous bone as the bone graft of choice for maxillary sinus elevation.[4] This review, making use of a very large database, clearly described more favorable results using xenogeneic bone than with any other graft material, including autogenous bone.

## Influence of implant surface

It must in fairness be stated that the results of reviews may be influenced by compounding variables. In fact, the great-

est of these would be the surface characteristics of the implants placed in the grafted sinuses. Implant survival rates (minimum 1-year loading) are the most frequently reported outcome for this procedure as opposed to an alternative: the percentage of vital bone produced in a given time following sinus grafting (more about this later). A systematic review by **Pjetursson, et al.[5] (48 studies, reporting on 12 020 implants)** in 2004 separated the survival data for machined implants from that of textured implants and showed similar data for both autogenous bone and bone replacement grafts. In fact, multiple reviews have now stated that there is no evidence for the superiority of autogenous bone and that it can be replaced by xenogeneic material.

> "Multiple reviews have stated that there is no evidence for the superiority of autogenous bone and that it can be replaced by xenogeneic material."

## Use of membranes advantageous?

When our colleagues and we first started placing sinus grafts, we considered it a form of Guided Bone Regeneration and, therefore, chose to cover the grafts with a membrane to both exclude soft tissue components and prevent avulsion of the particulate graft from the sinus. One of our studies **(including 12 patients)** utilizing Geistlich Bio-Oss®, the grafting material we now choose to call the standard control for our research, compared sinuses grafted with no membrane coverage to those covered with Geistlich Bio-Gide® or Gore-Tex membranes.[6] The study showed a higher percentage of vital bone with the two membranes (comparable), with both membrane cohorts being higher than the no membrane cohort.

Further, systematic reviews also showed a higher implant survival rate when membranes were utilized.[4,5] This topic is now debated, as some recent histomorphometric studies **(meta-analysis by Suarez-Lopez Del Amo including 37 studies) have** shown there to be no difference in vital bone formation with the use of a membrane.[7] While this more recent research may appear to confuse the issue, one possible explanation for the different results may be the location of the core harvest. Earlier studies harvested histologic samples from the lateral window area while more recent studies harvest from the implant receptor sites, where new bone formation may be occurring closer to the vascular supply of the sinus walls.

## Slow replacement: advantage or disadvantage?

One of the reasons autogenous bone and allografts are still preferred by some clinicians involves a misconception about the significance of the very slow replacement (or non-replacement) of Geistlich Bio-Oss® in the grafted maxillary sinus. The critical argument against the use of xenogeneic materials is that "non-vitalized" bone would directly impede osseointegration. In performing human sinus research with various grafting materials, it appears that a reliable "average" 6-month endpoint for vital bone formation with xenogenic bone might be of the order of 25 % new vital bone, 25 % residual xenogeneic graft and 50 % marrow. The fact that the above histomorphometric results are seen alongside implant survival rates of 95+% seems to negate slow replacement concerns and, therefore, deserves further explanation.

Firstly, it should be realized that histological examination of explanted sinus implants never shows direct contact between residual xenogeneic bone and the implant surface. There is always an interface of soft tissue or bone between the implant and the residual graft particles. Secondly, it is not correct to say that the residual xenogeneic particles are wholly non-vital. A recent study by **Galindo-Moreno[8] (including 50 patients with 50 sinus floor elevations)** utilizing morphological image analysis and immunohistochemical techniques has shown neovascularization of the Geistlich Bio-Oss® particles, CD44-positive cells within the particles, and osteopontin expression within the osteocytes and at the interstitial boundaries between residual Geistlich Bio-Oss® particles and newly formed vital bone. What this means "in a nutshell" is that it might not be correct to view graft material resorption as a necessary quality of a grafting material! These results were corroborated and illuminated with brilliant histology from a recent extraction socket study by **Scheyer et al.[9]** The histology again clearly recognizes the vitalization of the xenogeneic bone substitute particles.

## Tenting the Schneiderian membrane with implants

There are other protocols that have been utilized for creating bone in the maxillary sinus. **Lundgren, et al.[10] (including 10 patients with 12 maxillary sinus floor augmentations)** proposed elevating the Schneiderian membrane and tenting it in place with dental implants. A blood clot would then fill the space and subsequently mature into vital bone. This technique was utilized by **Cricchio, et al.[11] (84 patients, 96 membrane elevation procedures, placement of 239 implants)** where bone formation averaged 5.3 ± 2.1 mm with a high implant survival rate. While this technique proved effective, the amount of bone volume achieved was likely compromised by the limited ability of the blood clot to maintain space, with subsequent bone formation occurring to a point just short of the implant apices.

> "The only product that showed potential was rh-PDGF-bb which resulted in a significant reduction in graft maturation time."

## Sinus lift and tissue engineering

Another approach to sinus grafting has attempted to utilize tissue engineering principles to replace the need for bone grafting materials or enhance their performance. While mesenchymal stem cell therapy is at the present time not practical for general use, autologous blood-derived products (PRP, PRF), bone growth factors, and bone morphogenetic proteins are currently available for on-label and off-label protocols in sinus grafting procedures. The Academy of Osseointegration recently published the findings of a summit meeting on the best evidence for treating the posterior maxilla. The section on tissue engineering provided a systematic review by **Avila-Ortiz, et al.[12] (including 89 articles with data from 21 randomized controlled clinical trials).** The evidence indicated that the 12 autologous blood derived products did not show a significant advantage compared to the controls. In 4 rh-BMP-2 studies, 3 showed no significant differences compared to the control, and 1 was significantly lower than the control of Geistlich Bio-Oss® alone. The only product that showed potential was rh-PDGF-BB, which in combination with Geistlich Bio-Oss® resulted in a significant reduction in graft maturation time when compared to the Geistlich Bio-Oss® control.

## Concluding remark

So the question arises, "What should I do tomorrow?" After eliminating those therapies that do not seem to show an advantage, we still have a number of potential choices. These choices are based upon an evidence base that may vary in size from one therapy to another. We generally follow the evidence trail and the preponderance of evidence, with over 1000 published studies, which leads us to select Geistlich Bio-Oss® as our graft material of choice, covered by a Geistlich Bio-Gide® membrane that easily adapts to the lateral wall and has proven itself to produce the same results as a non-resorbable membrane. If a reduction in maturation time were of importance, the addition of rh-PDGF-BB as a hydrating agent could significantly enhance this parameter, yielding similar results in a shorter time frame.

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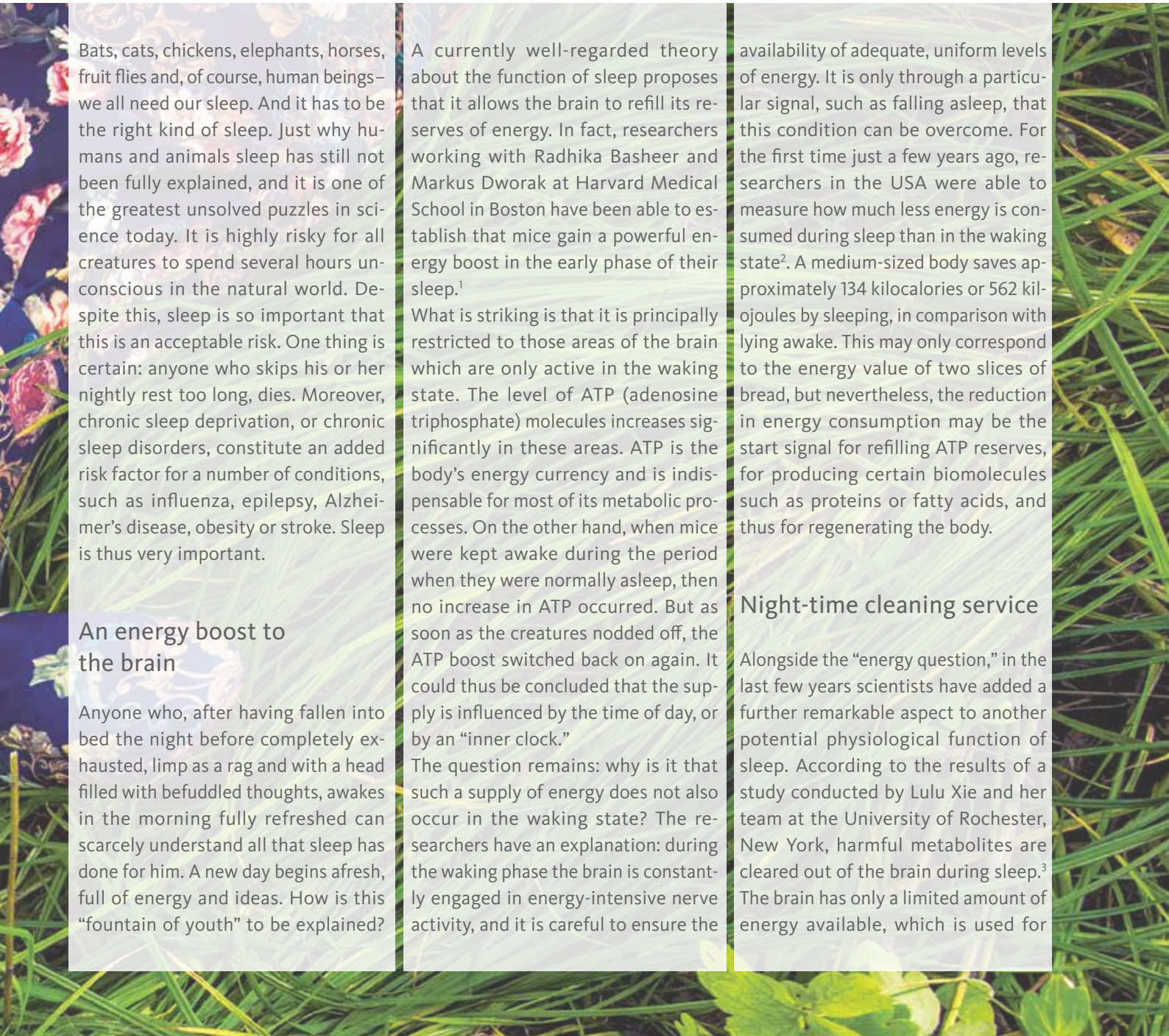
# REGENERATION DURING SLEEP.

Being unconscious and defenceless for hours at a time poses a risk for every living creature. What makes sleep so important that it is worth taking the risk?

Photo: ©iStock.com/kuzmichstudio

**Dr. Klaus Duffner**

Sleep is still one of biology's greatest secrets. It is well established that we regenerate both body and soul completely during the hours of unconsciousness. Researchers are engaged in unravelling this puzzle.



Bats, cats, chickens, elephants, horses, fruit flies and, of course, human beings – we all need our sleep. And it has to be the right kind of sleep. Just why humans and animals sleep has still not been fully explained, and it is one of the greatest unsolved puzzles in science today. It is highly risky for all creatures to spend several hours unconscious in the natural world. Despite this, sleep is so important that this is an acceptable risk. One thing is certain: anyone who skips his or her nightly rest too long, dies. Moreover, chronic sleep deprivation, or chronic sleep disorders, constitute an added risk factor for a number of conditions, such as influenza, epilepsy, Alzheimer's disease, obesity or stroke. Sleep is thus very important.

## An energy boost to the brain

Anyone who, after having fallen into bed the night before completely exhausted, limp as a rag and with a head filled with befuddled thoughts, awakes in the morning fully refreshed can scarcely understand all that sleep has done for him. A new day begins afresh, full of energy and ideas. How is this "fountain of youth" to be explained?

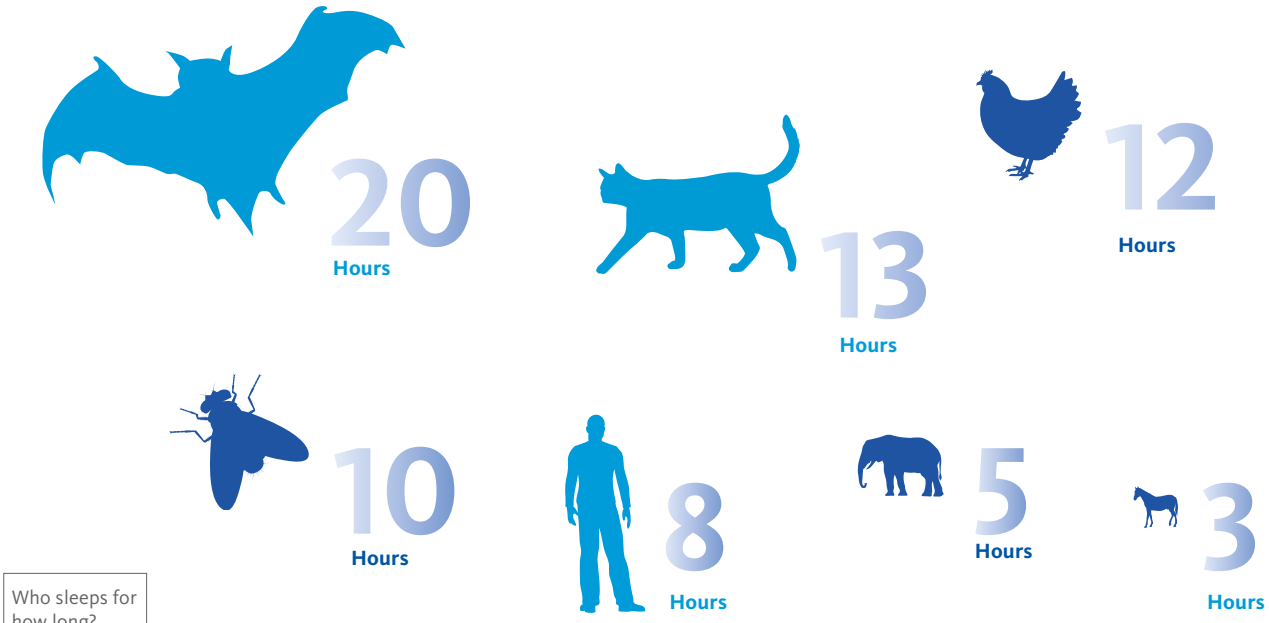
A currently well-regarded theory about the function of sleep proposes that it allows the brain to refill its reserves of energy. In fact, researchers working with Radhika Basheer and Markus Dworak at Harvard Medical School in Boston have been able to establish that mice gain a powerful energy boost in the early phase of their sleep.[1]

What is striking is that it is principally restricted to those areas of the brain which are only active in the waking state. The level of ATP (adenosine triphosphate) molecules increases significantly in these areas. ATP is the body's energy currency and is indispensable for most of its metabolic processes. On the other hand, when mice were kept awake during the period when they were normally asleep, then no increase in ATP occurred. But as soon as the creatures nodded off, the ATP boost switched back on again. It could thus be concluded that the supply is influenced by the time of day, or by an "inner clock."

The question remains: why is it that such a supply of energy does not also occur in the waking state? The researchers have an explanation: during the waking phase the brain is constantly engaged in energy-intensive nerve activity, and it is careful to ensure the availability of adequate, uniform levels of energy. It is only through a particular signal, such as falling asleep, that this condition can be overcome. For the first time just a few years ago, researchers in the USA were able to measure how much less energy is consumed during sleep than in the waking state[2]. A medium-sized body saves approximately 134 kilocalories or 562 kilojoules by sleeping, in comparison with lying awake. This may only correspond to the energy value of two slices of bread, but nevertheless, the reduction in energy consumption may be the start signal for refilling ATP reserves, for producing certain biomolecules such as proteins or fatty acids, and thus for regenerating the body.

## Night-time cleaning service

Alongside the "energy question," in the last few years scientists have added a further remarkable aspect to another potential physiological function of sleep. According to the results of a study conducted by Lulu Xie and her team at the University of Rochester, New York, harmful metabolites are cleared out of the brain during sleep.[3] The brain has only a limited amount of energy available, which is used for




Who sleeps for how long?



mental functions during the day. So that these functions are not negatively impacted, it reschedules its main cleaning regime to the after-hours. The brain must decide between two functional states, says co-author Maiken Nedergaard in the journal Science, "either it is awake and on the alert, or it's asleep and can have a bit of a tidy up." The so-called glymphatic system, which was only discovered a few years ago, is particularly important for these nocturnal cleaning activities. It is a network of tiny channels that transport cerebral fluid, and in the cranium it replaces the lymph system, which is responsible for carrying waste products away in the rest of our body. These tiny drainage channels are not controlled by nerve cells but by glial cells, which carry out the actual protective and enveloping functions in the brain.

## Gaps to allow drainage

In order to gain more knowledge about this drainage system, scientists injected a coloured dye into the cerebral fluid of sleeping mice. They were able to establish that it penetrated much more deeply into the tissue during sleep than in the waking state. While the dye penetrated approximately ten-times more effectively into the depths of the drainage system in sleeping animals, it was restricted to the surface of the brain in mice that were awake. At the same time, the researchers showed that the nerve cells contract during sleep, creating gaps. The intercellular space in the brains of rodents that were awake accounted for only 14 percent of the cerebral volume, while in sleeping animals it was 23 percent. Unusable proteins and other substances can drain away through these nocturnally-formed gaps, along with the cerebral fluid, into the bloodstream. These include β-amyloids that are associated with Alzheimer's disease, for example. They were cleared away during sleep twice as quickly as during the waking state. The neurotransmitter noradrenalin may well play an important role in these contraction processes, say the researchers, as its concentration is reduced in the sleeping brain.

The body needs an adequate amount of sleep in order to carry out this "cleaning service" efficiently. The American researchers suggest that if this is interfered with for any length of time, then substances hazardous to health can accumulate in the brain and create favourable conditions for diseases such as Alzheimer's or Parkinson's disease. Whether it is the replenishment of our energy reserves or the removal of harmful substances that is responsible for our need to sleep - a small miracle of regeneration takes place in our bodies every night.

**Literature**

1 Journal of Neuroscience, Bd. 30, Nr. 26, S. 9007
2 Journal of Physiology, Bd. 589, S. 235
3 Lulu Xie et al.: Science, DOI: 10.1126/science.1241224

# BACKGROUND.



**My patient treated with Geistlich Bio-Oss® and Geistlich Bio-Gide® has been in space as a member of the International Space Station. Geistlich Biomaterials – predictable results used in space.**

Sergey Tereshchuk
Moscow | Russia

**Geistlich, one word: SAFETY**

Lorenzo Ronco
Turin | Italy

**I have been using Geistlich Bio-Oss® and Geistlich Bio-Gide® for the last seven years. I consistently get great results, even in challenging cases.**

Georgios Giannelis,
Vancouver | Canada

**Don't just place any graft, just use the one you trust! Geistlich Bio-Oss® and Geistlich Bio-Gide®!**

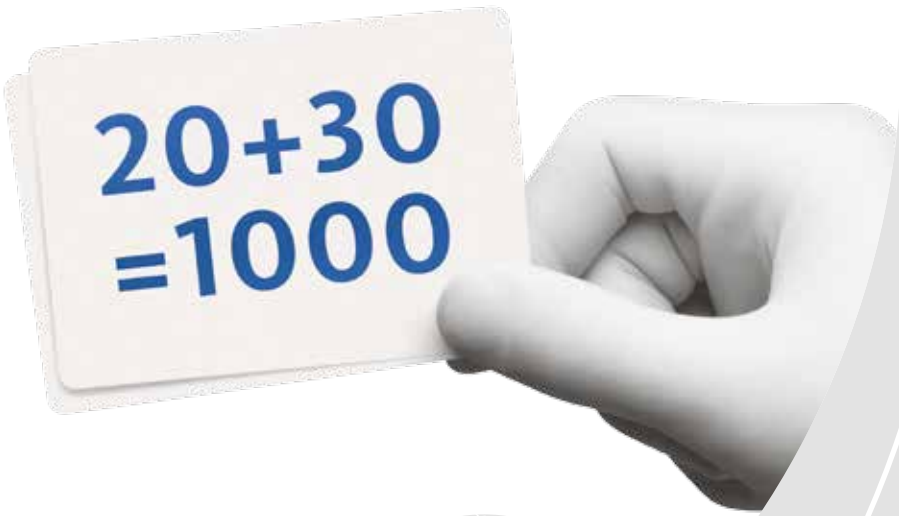
Kar Lai Bosco Wong,
Kowloon | Hong Kong

**Excellent product. It has boosted the world of bone augmentation. Looking forward to its re-entry into the Indian market.**

Vinamra Dhariwal
Chennai | India

# GEISTLICH JUBILEE

Over the course of the year many people have congratulated us on our triple jubilee – 30 years of Geistlich Bio-Oss®, 20 years of Geistlich Bio-Gide® and 1,000 scientific publications. These good wishes have inspired us, and we would like to thank you all by providing a short selection of messages!




**Over the years I have been asked to use products that are "like" or "similar" to Geistlich Bio-Oss®/ Geistlich Bio-Gide®. What I have found is that both Geistlich Bio-Oss® and Geistlich Bio-Gide® have provided my patients with such good outcomes that I won't switch to an inferior or cheaper product and risk that success for my patients.**

Mark Sutor
Bloomington | USA

# Regeneration Leaders' Meeting in Zurich

**Dr. Mireia Comellas & Verena Vermeulen**

**Guided bone regeneration (GBR) is a classic – but is it also constantly improving? What are its key features today? What is its potential, and where are its limits?**

Geistlich posed these questions to 15 international dental experts at the Regeneration Leaders' Meeting in Zurich, held from 14 to 15 June 2016. The 20+30=1,000 product jubilee was the reason for this gathering, which can also be viewed as a GBR anniversary.
In over 90 percent of cases, according to the majority of participants, the established methods work perfectly. There is potential for improvement, however, for patients with health problems, such as osteoporosis, diabetes or HIV.

Photo: Marcus Brodt

There is also potential for making techniques simpler and more predictable. Most participants felt that there will be easier handling and lower levels of technical sensitivity in the future.
There is a third possibility for improvement related to the common understanding of key GBR terms. What percentage of new bone is needed before we can speak of "regenerated" bone? What do we mean by stability? What level of vascularization is ideal, and what level is inadequate? The use of common terminology and reliable measuring procedures are important first steps towards the future of GBR.

Scan the code and watch the short movie about the meeting.

# Geistlich Bio-Gide® Shape

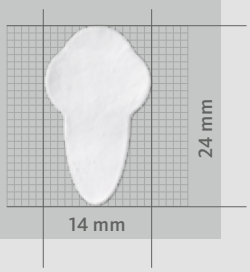
**Susanne Schick**

**Geistlich Bio-Gide® Shape was developed specially for alveolar Ridge Preservation with a defective buccal bone wall**

The membrane is based on Geistlich Bio-Gide® Perio-technology, but with increased rigidity. This product characteristic makes for easy handling and a high level of application comfort. The pre-formed membrane saves valuable preparation time and can be applied easily from the inside

"Geistlich Bio-Gide® Shape is a very user-friendly product that simplifies the management of extraction sockets."

**Dr. Daniele Cardaropoli, Turin | Italy**




(or from the outside when building up a gingival pocket) of the extraction socket buccal wall before bone replacement material is inserted. The graft is thus effectively shielded from the soft tissue in the buccal direction, while the upper part is reliably sealed crestally in the outward direction. Geistlich Bio-Gide Shape® complements Geistlich's range of products for alveolar ridge preservation. Approximately 90 percent of bone volume can be retained after tooth extraction by using this technique[1].

**The availability of the product depends on the individual country: for more information, please contact your local representative.**

**References**

1 Cardaropoli D, et al.: Int J Periodontics Restorative Dent 2014; 34(2): 211–17.

Geistlich Bio-Gide® Shape in extraction sockets: Scan the code and watch the video.

# In the microcosm of cells

**Dr. David Märki & Verena Vermeulen**

Illustrations: Quintessence Publishing Group

**Geistlich Biomaterials has provided support for the new film in Quintessence's "Cell-to-Cell Communication" series.**

"Guided Bone Regeneration" is the fifth film in the "Cell-to-Cell Communication" series to be released by Quintessence since 2011. The film allows us spectacular insights into the microcosm of cells, where the process of Guided Bone Regeneration begins, which is otherwise invisible to the human eye. What roles do osteoblasts, osteoclasts, periocytes, thrombocytes, fibroblasts and other cells play? In what sequence are they active? How do they communicate?

The authors, Bernd Stadlinger and Hendrik Terheyden, in collaboration with the Advisory Board, have created a masterpiece of animation. The film is available free of charge to universities and other organizations upon request – if you would like to request a copy, please contact Änne Klebba at: klebba@quintessenz.de

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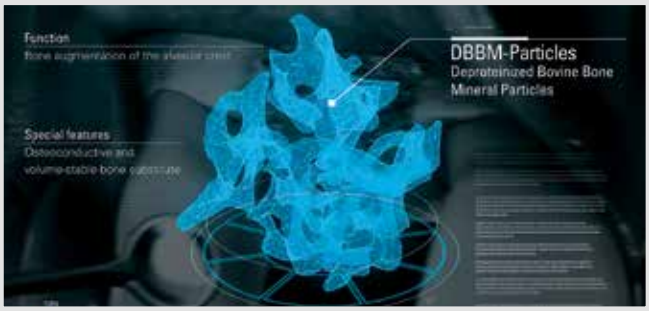
You can find the trailer here:




# CASE BOX – recording and sharing cases made easy

**Dr. Heike Fania**

Documenting, assessing, comparing cases from your own practice, sharing and discussing them with colleagues, publishing them, or simply viewing different cases belonging to colleagues around the world – CASE BOX can do it all.

Launched by the Osteology Foundation in April, CASE BOX is part of THE BOX online platform offering practitioners and scientists across the globe the opportunity to contact one another and exchange views on all kinds of topics relating to oral regeneration. Already the platform has more than a thousand members.
CASE BOX was developed to give practitioners the opportunity of recording their cases involving regenerative therapies, comparing and sharing them with colleagues and discussing them. The user can choose whether he wants to keep his cases to himself, share them with certain colleagues or his particular network, or present them to all users on THE BOX platform.
One of the main aims in developing the CASE BOX was to make it easy to use, but at the same time to allow the user to upload as much information as possible for each case. Even if the dataset is not complete or not all information is yet available, cases can still be saved.


## Step by step

The user is guided through the process step-by-step: he can select the starting situation and indication right at the beginning. After which, the following information is requested, one piece at a time:

**Step 1:** User's own case title – this is never visible to other users, even when the case is shared.

**Step 2:** Time points – dates are selected that are relevant to the case. Only "surgery" is obligatory. The user can also add other time points later.

**Step 3:** Demographic patient data – gender, age and ethnicity.

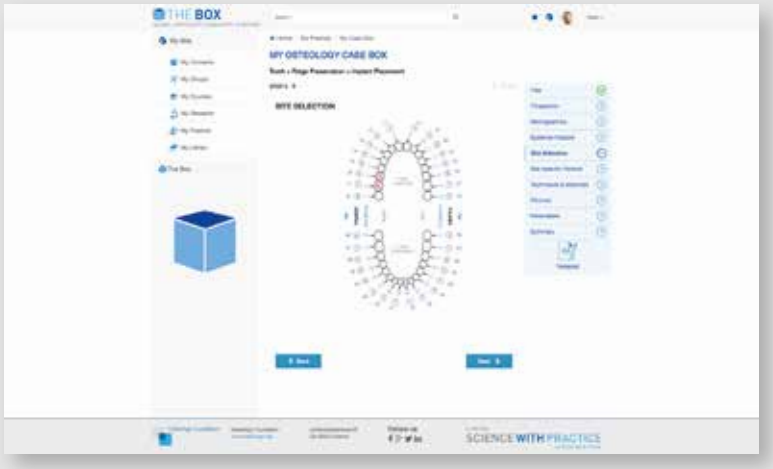
**Step 4:** Systemic factors – different factors are requested that can influence the success of treatment, for example, pre-existing conditions, periodontal status, and other diseases.

**Step 5:** Treated position – selection of the treated teeth or area of the jaw is carried out using a diagram and is thus independent of the dental notation scheme applied.

**Step 6:** Local factors – local factors can be entered for each previously selected position, such as biotype, recession, periodontal status or bone defects.

**Step 7:** Techniques and materials – the user can select which materials he has used in the treatment, such as bone replacement materials, membranes, autologous transplants, medicines or growth factors. He can also enter information on the operational techniques used.

**Step 8:** Images – photos can be uploaded easily using the "drag & drop" function for all selected time points. The images can then be mirrored, cropped or rotated.




Selection of treated teeth with the aid of a diagram in the CASE BOX.

**Step 9:** Parameters – depending on the indication, the most important clinical parameters for this treatment will be requested. such as the width of the keratinized mucosa, the recession depth or degree of pain. The values can be entered individually for each position selected previously in Step 5.

**Finished** – the entire case has now been recorded in just 9 steps. Overall, it takes about 10 minutes to record a case in the CASE BOX and to complete all the relevant fields. Other information is also available for many of the parameters, for example, how they should be measured, or on which classification they are based. This information can be accessed by clicking on the question mark.
The user can write up other notes and background information, which could be relevant to the case, in an online notebook. This can be filed and saved individually for each case and is not publically accessible.

## My Practice – all cases on view at any time

Many users will certainly be interested in sharing their cases with others. They can either do this after the last step when uploading a case, or later in the My Practice area, where the status (public, shared, or private) is visible and can be changed. A case that is "public" is visible to all registered users. You can find it in the CASE BOX under "Browse Cases," and you can also leave a comment or ask a question.

## Analysing cases

The CASE BOX "Analyse" function will be especially exciting for many users, particularly, as the number of cases increases. They can display the results of their treatment graphically as a diagram using this function and can see the changes occurring over time. What's more, they can compare their cases with all their cases in this indication or even with a general datapool that includes all the values for all cases that have been uploaded by users for this particular indication.
The predictive power of this data is, of course, minimal. The results of the analysis must certainly be interpreted with great caution and be regarded critically. But nevertheless – especially as the number of cases in the database increases – one or more valuable insights may emerge.

THE BOX online platform can be found at: www.box.osteology.org, or by clicking on the link on the Osteology Foundation start page at: www.osteology.org. You only have to register once as a new user. If is free to use the platform and all the tools and content.

**Register now, it's free!**
**www.box.osteology.org**

# In Monaco with Julio Joly

The interview was conducted by Débora Furlani

We are standing here at the coast in Monaco. Do you like the place?
**Julio Joly:** Monaco is a model of sophistication and natural beauty for Brazilian eyes. As a child, I used to follow the Formula 1 races of Ayrton Senna in Monte Carlo and wanted very much to get to know this charming principality.

What was your highlight at the Osteology Monaco Symposium?
**Julio Joly:** I am a diehard fan of the work of Profs. Cortellini and Zucchelli. They have greatly influenced our periodontal training. I cannot omit the workshop presented by my partner Robert Carvalho da Silva either. We are very proud to participate in this important event and to be able to present the work of our group to the global dental community.

Soft-tissue management is a major topic at congresses such as Osteology Monaco. Have the techniques improved in recent years?
**Julio Joly:** I believe that the major changes are related to the development of minimally invasive techniques and also advances in tissue substitutes. A combination of these factors has made it possible to achieve ever more natural results, with minimal discomfort to the patients during and after surgery.

Are there differences between European and South American dentistry?
**Julio Joly:** I do not see many differences. It seems to me that in recent years South American dentistry, especially in Brazil, has started to attach a higher value to aesthetics, as requested by patients. In addition, Brazilian dental students have more opportunities to perform surgical and restorative procedures on patients, which makes them more secure and versatile when making decisions. The scientific training of European dentists is rock-solid, but I feel that the accumulation of clinical experience requires continued courses after university training.

Looking at the sea – do you have any sea-related hobby such as sailing or water-skiing?
**Julio Joly (laughs):** Frankly, I am not a great fan of maritime sports. My great pleasure is to enjoy the scenery, preferably together with my family, good friends and a cold beer.

**Prof. Julio Cesar Joly** is the Coordinator of the Master of Science Programs of Implantology and Periodontology at São Leopoldo Mandic Dentistry Research Center in Campinas. He is also a professor at the ImplantePerio Institute in São Paulo and author and co-author of several scientific publications and chapters in textbooks.

Photo: Frederic Meyer

# Issue 1|17

**will be published in April 2017.**

FOCUS

## Risks and complications

When care is advisable during regenerative procedures

JOURNAL CLUB

## Tooth retention vs. tooth extraction

Which procedures deliver the best results?

BACKGROUND

## Geistlich webinars 2017

Interactive online-lectures that are truly worthwhile


IMPRINT

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