

Possibilities and Limitations of Ceramic Implants

Early in 2005, Paracelsus Clinic's dental department started deploying the new implant-system «Z-Look3». Since then, patients' demands have significantly increased.

The results achieved so far are promising: no implant was lost, and re-implantation was required in two cases only. Without exception, the respective healing processes went off without any major incidents.

The performance of soft as well as of hard tissue is excellent. In approx. 60 % of the cases, a traditional form of implantation had been carried out. This means, the respective dental extraction dated back six months or longer. 20 % of the patients underwent immediate implantation with or without bone augmentation. There is a strong upward trend to this.

As for the remaining implantations, the implants were embedded while simultaneously bone-regenerating measures were taken in the same session. Patients show a strong interest in this unique method and frequently ask the same questions.

This paper aims at answering most of them. Its intent furthermore is to resolve the most frequent ambiguities and uncertainties.

What happens subsequent to dental extraction?

Unfortunately, dentistry has not yet reached a state that would obviate the need for dental extractions. In Switzerland alone, approx. 400.000 teeth are extracted annually. Dental extractions will result in the presence of a wound. Its healing likens a maxillo-dental re-modeling process.

Both, the loss of bone structure and gingival deformations are unavoidable. In particular, throughout the first post-tooth removal year up to 50 % of the alveolar ridge will decrease – two thirds of which over the first three months. During the first eight weeks after dental extraction, high osteoclast-activities can be observed. (Osteoclasts are cells which cause bone resorption). The respective consequence is a reduction of the bone margin (height and width). With patients equipped with total dentures, continuous reductions of the alveolar ridge were proved several decades after loss of their natural teeth. The jaw bone's atrophy deteriorates those aesthetic and functional conditions which are needed to enable ideal provision with prostheses.

Contemporary dentistry strives to offer what nature has not provided for. By taking preparing or accompanying augmentation measures, prophylactic measures with regard to soft and hard tissue, and by deploying various implantation techniques, the achievement of individually ideal restoration results is aspired.

Patients are offered a wide range of methods and systems. However, not all of them are of equal value. Therefore, they should be thoroughly assessed as to their pros and cons.

Holistic medicine and dentistry address the issue as follows:

Why the Paracelsus Klinik will not deploy any titanium implants:

- **Inflammation**

Approx. 1 % of all patients experience an inflammatory reactions to titanium implants.

- **Galvanic Interferences**

Titanium is a metal which – in combination with other metal structures (such as crowns, bridges, and prostheses) and the presence of electrolytic saliva – will generate electrical voltage. As such, so-called oral currents (galvanism) will form.

- **Metallosis**

The term metallosis means the maxillo-dental release of metal ions. It leads to the observable presence of «titanium particles» in body tissues such as jaw, lymphatic nodes or lung. Such metal intoxications will stress the meridians. This phenomenon is referred to as regional-stress or meridian-stress.

- **Titanium Oxides**

On the surfaces of titanium implants, titanium oxides which may break up osteoblast-phagocytosis are formed. In this course, titanium particles will deposit within the regional lymphatic nodes.

- **Titanium and Calcium**

Any contact between titanium and bone cells will result in a lack of calcium. On an intracellular level, the concentration of calcium ions (Ca²⁺) will be adversely affected. Thus, the calcium concentration within the respective cell will decrease.

- **Titanium and Fluorine**

Any contamination of fluorine by titanium will reinforce fluorine's adverse effects.

- **Electromagnetic Stress and Electric Smog**

Titanium implants act as cranial antennas or electrodes.

- **Aggravation of Health**

Compensation of problems on meridians and organs may adversely affect a patient's general condition.

- **Additional Risk Factors**

- DNA damage
- Lymphocyte transformation
- Photo catalysis
- Biocompatibility
- Cytotoxicity

Advantages of Ceramic Implants at a Glance

- **Material**

It should be clear that any kind of material embedded in the oral cavity constitutes foreign matter the human organism might react to. Therefore, we should strive to find materials to which human bodies preferably have neutral, however under no circumstances have adverse reactions to.

Zirconium oxide is considered ideal material for all kinds of dental uses and features significant advantages.

«Z-Look3» implants are entirely made from ceramic zirconium oxide.

These are one-piece implants (mono blocks). After the completion of the healing process, the prosthetic device applied will be made of the same material. In particular for allergy sufferers and electro-sensitive persons, ceramic dentures will be the first choice. Ceramic zirconium oxide will not interact with other dental materials.

- **Resistance to Breakage & Load Capacity**

Ceramic is still frequently considered brittle and fragile. However, this is not the case with these high-tech ceramics (Z-Look3-implants). Implants made from zirconium oxide ceramics feature a load capacity that exceeds the one of titanium implants at least by three to four times!

- **Tissue Performance**

Tissue performance of the new generation ceramic implants has been tried to be compared to the titanium implants. Most recent clinical studies prove zirconium oxide implants to feature an excellent tissue performance. Both, hard tissues (bone) as well as soft tissue (gums) react better to zirconium oxide implants. This is explained by zirconium oxide's charge - which prompts osseo-inductive effects – as well as by the implants' make (one-piece screw-type implant).

Hard Tissue

Inserting titanium implants into the jaw bone results in initial fixation. The respective primal stability is a purely mechanical phenomenon. The implants' secondary stability will not be achieved before the onset of healing processes along the interfaces of the bone-implant. The healing processes will first cause the formation of hemal coagulum; next, so-called pre-osteoblasts will start to deposit un-calcified basic substances (osteoid) and finally, calcium and phosphate will be incorporated. This causes the formation of crude bone.

As a consequence of these restructuring processes, functional bones will be formed gradually. Bone contact and subsequent bone formation, located at lateral crests and grooves of the ceramic implants threads will proceed differently.

Professor Wagner from the University of Mainz as well as physicians working at the University of Constance carried out histological and microscopic examinations of the above-mentioned implant.

Already during implantation, «Z-Look3» implants stand out compared to other systems. This is caused by the fact that these implants are equipped with a self-cutting thread and will thus best facilitate primal fixations which are sufficient from day one until the implant's apex.

After a certain time past implantology, a regeneration process can be observed. Over the first six to eight post-surgical weeks, bone contact will mostly take place at the lateral crests of the threads.

Over the course of osseointegration, bones will also form at the thread grooves and thus entirely cover the ceramics by osseous material. At first, the bone will show a crude, non-lamellar structure. Later,

though, a histological osseo-integrated ceramic screw-type implant will even be found at the thread's grooves. The contact between fixing bone and ceramic material may generally be considered satisfying. Immediate post-implantation bone resorption, as appears with titanium implants, can not at all be observed with zirconium oxide implants. On the contrary: with zirconium oxide implants, «peaking» bone can be found.

During production, a special coating is applied to the surfaces of «Z-Look3»-implants.

This also consists of zirconium oxide which provides the implants with a rough surface to facilitate bone augmentation.

The fact that rough implant surfaces support better contact between bone and implant is undisputed. After a term of approx. 6 months, the implant will be firmly integrated with the jaw bone.

Soft Tissue

The most recent studies introduced at Nobel Biocare Worldconference, taking place in June 2005 in Las Vegas, verify that the active recreation of gingiva sets in as early as three weeks past implantation.

Astonishingly, artificial ceramic teeth will support gingival recreation even better than healthy teeth do. In particular, the papilla region features a high growth potential. The upper jaw's vestibular soft tissue and the lower jaw's lingual soft tissue will be preserved. Different types of retraction, as apparent with titanium implants, are not observed.

In general, after completed healing processes, more gingiva than immediately post-surgery will be found at zirconium oxide implants.

Please note!

Recent studies, as well as our own observations, show that such positive reactions will only be achieved with implants that are deployed in interference-free environments.

Even most minor continuous stress to the new implant will quite surely result in its loss. Therefore, a six-month term of taking protective measures following implantation is mandatory.

- **Color**

Another huge advantage of ceramic implants is their color: bright white. In case paradontosis is suffered from over the years and gums recede respectively, bright ceramics appear more aesthetic than the metallicly shimmering (black) edges titanium implants will show.

- **One-Piece Design**

The one-piece design results in significantly higher stability. The bending strength «Z-Look3»-implants feature amounts to about 1500 MPA. Compared to that, titanium implants will not exceed a value of 400 MPA.

The system's one-piece design reduces bone resorption processes while supporting the gingival regeneration potential.

The one-piece design allows for easier surgery and healing without any complications. The implantation process will be reduced to one surgical intervention only. The mucosa of the proposed spot will be laid aside, and then the implant will be gradually worked up as to customized length and diameter.

Post-surgically, the gingiva will be carefully sutured. After about two weeks, the healing process will be completed and followed by a load-free healing phase, depending in duration on the respective osseous performance of the patient.

On average, this will take – for the lower jaw –between three and six months and five to six months for the upper jaw, respectively, as the density of bone in upper and lower jaw differs from each other. For this interim period, provisional dentures or guard rails will be deployed.

«Z-Look3»-Implants' success rate is fundamentally based upon the implants' successful protection throughout the healing process. The time invested in protective measures will offset manifold over the period of prostheses being worn. Additionally, it ensures an excellent success rate. All protective devices' occlusion needs to be checked regularly, while the implants may not be exposed to any load thereby.

Over the entire healing period, any protective devices will have to be worn around the clock and may be removed only temporarily for the purpose of cleaning the teeth. A first tap test should result in the proof of primal stability. In case, this has not been achieved or got lost, it will be necessary to re-fix or even remove the implant. In the latter case, re-implantation will take place approximately 6 – 10 weeks later.

The one-piece design of zirconium oxide implants also provides new opportunities for patients who feature anodont (tooth less) jaws.

Many wearers of dentures frequently complain about poor fitting or aching pressure sores associated with partial or complete dentures. Adhesives and mechanical auxiliaries often only solve respective problems temporarily or to a non-satisfactory extent. One-piece ceramic implants may constitute a remedy. For instance, the wearing comfort can significantly be increased proportionally to the number of implants. The number of implants must be planned most carefully and usually amounts to four to six implants per jaw.

Prostheses are firmly fixed by vertical supports and can thus be exposed to common loads. Their left and right sides establish occlusal heights which will remain stable for a long time. This again may result in enduring relief of many facial and cerebral conditions (e.g. trigeminal neuralgia, pain in the temporo-mandibular joint, cervical vertebra conditions, facial pain, migraine, and ophthalmic diseases).

- **Aesthetics**

Patients' expectations in the field of «Red Aesthetics» are far easier to meet with zirconium implants than is the case with titanium implants. Due to high gum compatibility and low plaque affinity, gingival crown margins will not show any inflammatory symptoms.

Even rough surfaces, which facilitate the healing process, do not cause deposits of plaque.

All above-mentioned advantages serve to minimize the risk of an implant loss.

Since 15 years dentists are collecting data and experience with zirconium implants. The above mentioned advantages of one-piece design, tissue performance, elasticity and aesthetics will lead to more and more dentist using this kind of implants.

- **Acceptance**

Acupuncture meridians are the oldest information channels known to men. Meridians traverse the entire body and constitute links to teeth and dental positions, respectively, as well as to bodily organs. By measuring the skin resistance, acupoints located on the meridians may serve to indicate both, the single meridians' and the entire person's energy balance. Testing dental materials may furnish indications as to intolerances. Especially when the option of an implantation is considered, it is recommended to carry out respective pre-tests. At the Paracelsus Clinic, all patients will not only be tested with respect to blood and urine; additionally, EAV-tests will also be performed. If necessary, other test methods such as kinesiology or LTT may also be applied. The tests carried out so far show the human body's excellent acceptance of zirconium oxide. Only with very few cases,

suspected intolerance occurred. For most of the respective patients, this turned out to be a medical condition that could be resolved by adequate treatment.

Possibilities and Limitations of Ceramic Implants

Ceramic implants gain more and more in popularity.

As far as the selection of implants is concerned, from a holistic point of view the following aspects should be considered:

• Contra-Indications

Not all patients qualify for implants. Implantations should not be performed in cases of:

- incomplete facial growth
- present infectious diseases in the oral area
- presence of untreated paradontosis
- pathological changes of the oral mucosa
- Expected wound healing disorders. This is generally the case with bones that have undergone radiotherapy, coagulation disorders, diabetes, and consumption of nicotine and/or drugs.
- The patient is not expected to co-operate. Patients are particularly expected to strictly adhere to protective measures during the first 6 months. Later, they will have to get the hygienic circumstances checked regularly.

Read more about contra-indications in our article entitled «Implant-Conception of Paracelsus Clinic».

• Positioning

The question whether an implant needs to be placed at the dental set's front or laterally makes a huge difference. In general, upper jaw healing will take longer than with the lower jaw. A single implant will be circulated by blood differently than is the case with multiple implants. Patients expect functionally and aesthetically ideal results – if possible for a lifetime.

Taking this into account, the following criteria should be considered:

Single Front Implant

For upper jaw fronts, analyses will already be carried out by use of single-tooth X-ray images. Adjacent structures such as nasal floor, paranasal sinuses, roots of adjacent teeth, and the state of soft and hard tissue within the gap and at the teeth adjacent to it will be examined.

With patients who underwent extraction of upper front teeth, we usually observe comparatively large-scaled bone resorption at the lateral side (towards the lip) during the healing process.

This loss of horizontal bone is most of all an aesthetic issue. Comparatively large gingival recesses can be observed above the dental crowns. The horizontal bone resorption will result in less space for the dentist to correctly place the implant. The vertical level will also be affected by bone resorption, i.e. the patients will lose all their bone lamella. This phenomenon occurs in 30 to 40 % of the cases and excludes the option of implantation.

The bone performance described above applies to all patients and is independent of their age and sex. If one or more upper front teeth need to be extracted, the approach to avoid bone resorption should be discussed and analyzed prior to an extraction.

Several options are at hand:

- Augmentation of hard and soft tissue along with dental extraction
- Immediate implantology
- Bone augmentation after completed healing, to serve as preparation for subsequent implantology
- Implantation and bone augmentation carried out in one session

The selection of the appropriate method significantly influences successful treatment and needs to be determined individually.

For lower front teeth, single tooth X-ray images are required, too. Similar to upper front teeth, the bone volume will be determined. After extracting lower front teeth, large-scaled bone resorption can generally be observed at the lingual side (towards the tongue). The respective bone resorption reduces the horizontal maxillo-dental dimensions. As a result, for 30 % of the cases implantology is excluded. The dentist will have to apply augmentation-techniques. In general, lower front teeth are always smaller and placed closer to each other than all other human teeth. This phenomenon leads to the need of a most thorough spatial analysis of transversal and sagittal dimensions and has strong impacts on the implants' subsequent «nourishment ».

Multiple Front Implants

If several upper front teeth are missed, what we most frequently observe is an increased loss of hard and soft tissue. The bone's reduced height and an insufficient width of hard tissue along with a loss of periodontal supporting tissue reduce the stabilizing effects for implants and lead to the necessity of making compromises as to the aesthetic results.

Frequently, contemporary augmentation-techniques improve the situation and should therefore always be applied. The patients' benefits from bone augmentation will be a higher primal stability and correct three-dimensional implant positioning. After the treatment, an ideal reconstruction is possible.

In the event of multiple upper front implants, in particular the nourishment of hard and soft tissue within the intra-implantation region must be observed during the healing process. Frequently, implants will need to be placed one by one to facilitate secondary stability.

This measure is more cost-intensive and will prolong the treatment duration. At the same time, however, it reduces the risk of tissue resorption and loss of implants.

Single or Multiple Upper Lateral Implants

This also requires X-ray images to assess the anatomical conditions. Unfortunately, up from about the center of the row of teeth towards its back, there is continuously less bone available. Without augmentation or reconstruction of the alveolar ridge, implantology can frequently not be realized.

Single or Multiple Lower Lateral Implants

The lower jaw's anatomy requires the accurate prior localization of the nervus alveolaris inferior and its ending.

The lower jaw features compact bone and thus usually shows better and quicker healing properties than the upper jaw does.

This advantage is most of all made use of by patients who wear complete dentures. To improve the chewing quality, «spherical implants», which the prostheses are fixed at, are deployed. Thus, eating will be enjoyable again.

- **Immediate Implantation**

Immediate implantation is a method that is supposed to support the ridge's preservation in case of dental extractions. Bone resorption, following the extraction of teeth, will frequently not only result in a loss of bone substance but also in aesthetic deterioration.

In particular, in upper and lower front areas this aesthetic component is of high importance. The goal of immediate implantation is to perform implant insertion and dental extraction in one session. This foreshortens the treatment by 6 months (post-dental extraction healing). Those three aspects led to immediate implantation being practiced more and more. The implant acts a module which supports the tissues and thus reduces or even totally eliminates resorption processes.

Unfortunately, post-dental extraction presence of intact alveoli is rather rare. Therefore, dentists will frequently have to deploy techniques of controlled bone augmentation. Small bone defects will heal spontaneously and do not require any additional measures.

A major contra-indication for immediate implantation is the presence of periodontal infected alveoli. On the contrary, periapically infected alveoli do not constitute a contra-indication, as long as sufficient bone substance to provide for the implant's primal stability is available.

- **Augmentation**

Several techniques of controlled bone augmentation have been in daily use over about the last 15 years. By now, regenerative measures of bone and soft tissue augmentation are applied with about 40 % of all implantations. More and more patients demand these measures to be taken immediately after dental extractions and intend this to serve as preparation for subsequently following implantations.

In most cases, bone substitutes are placed into the alveoli. On one hand, this serves to improve future availability of osseous material and membranes covering it. On the other hand, it is supposed to keep soft tissues away from regenerated bones. Our observations verify healing processes without any complications with the deployment of bone substitutes and absorbable membranes.

We recommend generally discussing this issue with your dentist prior to any dental extraction.

- **Biomechanical Aspects**

Ceramic implant's positive integration with bones serves as ideal pre-condition for long-term success. The supra-structures built upon the implants are able to absorb functional forces without breaking up the connections between implant and bone. The implant's established osseo-integration will not be affected by normal functions and tensile loading. However, occlusal overload, to large extensions, inaccurate tooth-implant-linkages or poor after care may act as possible causes for bad success. The fact that in the presence of extension bridges implants are exposed to larger forces is by now well documented. On implants located nearby extensions, forces twice as large as the effective chewing force can be applied. With implants in larger distance to extension, tension

loadings are measured. The dentist will need to integrate this translation of chewing forces with his planning. Mixed dental-implants prosthetic reconstructions require accurate design. It must be ensured, teeth are thoroughly embedded in the jaw by periodontal structures while still featuring physiological dental mobility. From this point of view, pure implant-bridges promise better results. Unfortunately, this is frequently not feasible. To detect complications in due time and thus prevent failure, regular removal of plaque and check-ups are mandatory.

- **Loads to Implants**

Contemporary implantology should generally strive for short treatment periods. Patients wish to obtain the supra-structures as quick and with as little as stress as possible. For ceramic implants the healing process will take about 3 to 5 months. If bone augmentation is necessary, the time until the implants can be inserted will depend upon region and extent of defects, ranging from at least 6 to 7 months. In practice, decisions as to when implants can be inserted will always be very individual depending on the case. Implants' live span are strongly influenced by the consumption of tobacco, alcohol, and drugs.