Zirconium dioxide implants— a holistic approach

Prof. Prof. h.c. Dr Werner Becker, Dr Witalij Kolbe and DT Artur Wolf, for dentists and patients alike, ceramic implants pose an alternative to titanium implants. You are advocates of a holistic approach in dentistry. Where do you stand on this topic?

Dr Kolbe: You may be amazed that I, as a previous implant opponent, have become an advocate of a certain realm of implantology. In my opinion, metal implants, especially those made of titanium, are obsolete due to their negative effect on the regulatory system. My colleague Prof. Werner Becker and I suggest that titanium implants can only be retained in the bone for a certain amount of time by an interactive, chronic "inflammatory process". From a medical point of view, this period can be quite long.

Prof. Becker: It is important to me that there is knowledge available on titanium as material used in implantology. Because, in this context, we are talking of material made of titanium alloys and not pure titanium. For processing requirements, there is no other option possible. The processing of pure titanium as a material wouldn't be easily accepted, as its metallic "toxicity" is undisputed among toxicologists, but it is ignored by dentistry. But this is unimportant for dental implants, as all of them are alloys with over 90 per cent titanium content. The rest is made of metal admixtures which facilitate later process ability. One of the most serious admixtures is aluminium, the toxicity of which is generally known in the medical field and which has been listed as one of the problem materials in the occurrence of Alzheimer's and Parkinson's diseases. This is demonstrated by research in this field.

The medical mechanism of action is the following: the titanium implant reacts with the protein of the bone where it is screwed or wedged. This creates protein titanium compounds known under the chemical denomination metal chelates. These generate an inflammatory process in the bone (peri-implantitis). Initially, this stabilises the implant in the bone, but from now on also is a constant chronic focus which requires extensive defence activities from the human immune system. If this process remains in its chronic phase through the body's "defence compensation", this kind of implant can remain in situ for a long time, but, as mentioned previously, under considerable strain on the body's general regulation system.

What is the consequence emerging from these inflammatory processes?

Prof. Becker: If this process becomes acute, it is usually bacterially superimposed and the implant "festers". The bone substance remains loaded in the peri-implant area, and continues to be a focus. In this case, the bone previously enclosing the implant must be milled out until healthy, in order to exclude any effects of this focus on the body. The circumstance just described occurred for the implant lost in the lower jaw. Titanium and its compounds are mainly neurotoxins. They destroy the protective membranes surrounding the nerve, the so-called myelin sheaths. An initial effect is mainly muscle pain, since the nerves supplying these areas are damaged, as well as damage to hard tissues of the body, such as hair, nails and bones.

To this date, dental prosthetics are mainly based on metallic materials. Examples include titanium suprastructures, gold crowns or amalgam fillings. How do you assess this situation from a biological as well as medical point of view?

Prof. Becker: It is important to note that in any case an electroplating of metal elements takes place in the oral cavity. These micro currents are responsible for destroying the nervous system also, as they suppress the transmission of stimuli through the synapses e.g. to the muscle tissue, and regulation therefore becomes impossible. Effects could be damage to the muscles, sensation changes, paralyses, atony and therefore muscle loss. These electric micro disruptions could also mix up the otherwise balanced microbe system in the gastrointestinal tract, and disorders e.g. of the bowel such as Crohn's disease or leaky gut syndrome can arise. The range of disease possibilities up to cardiovascular diseases and other internal problems must then almost be expected. However, each individual responds differently to these disturbances. That makes the diagnostic investigations particularly challenging.

What does this mean for the field of implantology?

Prof. Becker: What was said about metal implants also equally applies to ceramic or zircon implants. Everything depends on the source materials and their chemistry, and on the toxicological factors. As far as I am aware,

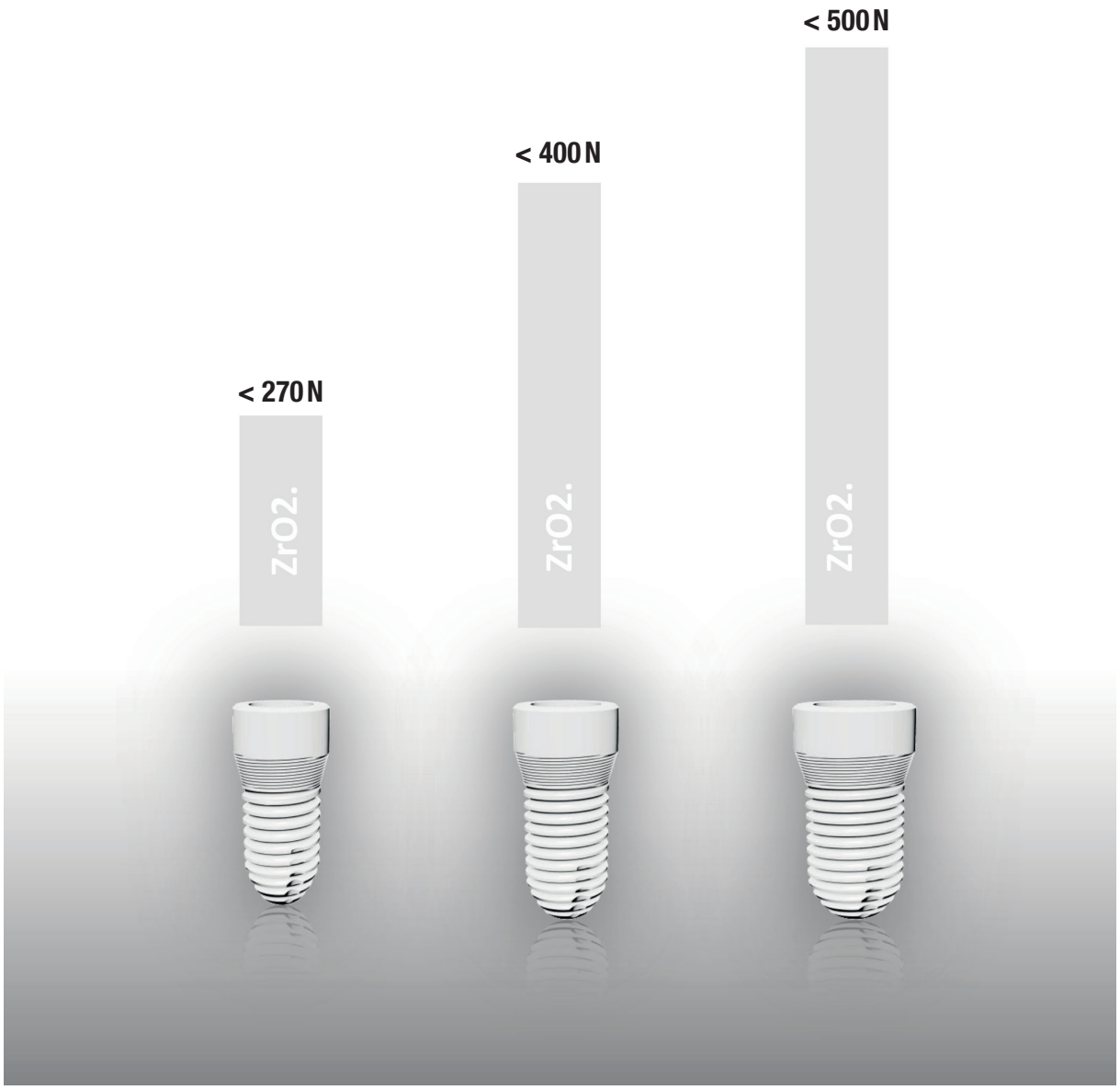

Fig. 1: Investigation report: dynamic and static examination according to ISO 14801.

there is only one zircon worldwide that does not contain aluminium. I do not know whether Canadian zircon meets these standards, as all the deposits known in Canada have natural admixtures of aluminium in zircon. I do not know of any deposit in the whole American region which is free from chemically questionable admixtures. Only Japan and Australia have deposits from which dental zircon products can be made. I have conducted in-depth research on zircon for about 15 years.

Dr Kolbe: I am, by now, convinced by zircon implants. They clearly guarantee inflammation-free integration. However, it must be said that that these implants either integrate or are lost very soon after implantation—as has been pointed out by a scientific group working with Andrea Mombelli at the University of Geneva. The loss of an implant usually happens without much "collateral damage", hence, without any further inflammation.

What could be the cause of those early losses that occur without any signs of inflammation?

Dr Kolbe: According to our experience, one reason or cause for such "spontaneous" implant failures could be the fact that past focal infections and interferences had not healed properly in the preliminary stages in the area designated for implantation. This applies to the bone as well as to the soft tissue. By the way, this assessment is in line with the approach of our colleague Nischwitz. In well over 90 per cent of these cases, I found out that there had previously been a serious incident of this kind in the bone, and that it still showed, despite its alleged healing, a defence reaction. In this kind of implantation area, metabolic processes occur which the tissue matrix cannot regulate in a "draining" manner. The so-called sol-gel transformation, as described in 2001 by Thomas Gyöngyösi, is the ability of cells and

tissue structures to self-regulate and, where necessary, to heal. If these self-regulatory forces are impaired, no decomposition product (as part of an inflammation) can be eliminated, and rejection occurs. This is my explanation for the sudden loss if zircon implants. It is therefore vital to record in advance a detailed assessment concerning the inaugurated implantation area. If that has been done, the implant can be placed in a holistically acceptable way.

Prof. Becker: My further point with regard to the focus or interference issue is that large-scale extraction wounds usually don't heal in such a way that they can then be considered focus-free. In the vast majority of cases, residual osteitides (persistent osteitides) remain on these "long stretches". These then form cavities in the bone that are filled out with connective tissue structures and are therefore "soft". These then produce substances that are not poisonous, but significantly disturb the metabolism of the surrounding bone and do not allow an optimal supply of this area. If these regions are later treated with implants, those implants find no stability and are soon "rejected". However, this applies to both, titanium as well as ceramic implants.

There is a variety of implant systems available, all based on different technologies, designs and prosthetic strategies. What is your implant system of choice?

Dr Kolbe: I use the new two-component ceramic system AWI by WITAR GmbH, a company based in Cologne. AWI is a simple and secure system with three main advantages: it is metal-free, biocompatible and aesthetic. The newly developed and patented two-component system made of biocompatible Y-TZP-ceramic is not only reliable and stable, but also easy to handle which has, subsequently, a positive effect on keeping costs and treatment time down. The new AWI implant system combines all advantages and proven characteristics of modern ceramic implants with a newly developed, extremely stable and tissue-compatible construction for transgingival healing.

In your opinion, what are the main surgical and prosthetic characteristics that distinguish this new system from others?

DT Artur Wolf: Whether in terms of aesthetics, stability, biocompatibility or osseointegration: AWI is not a replica of an existing system, but a real new development in all areas with its innovative design. The implant thus has a gap-reduced connecting system with a rotatable and cementable all-ceramic abutment, a tangential micro thread in the cortical bone area and a transgingival shoulder region which provides an ideal surface for the soft tissue and for the aesthetic transition to the prosthetic treatment. For successful osseointegration, it also has an ideal thread roughness of 1.7 µm—this was revealed by a study by the University of Jena on cell colonisation. The surface roughness can therefore be compared to that of leading titanium implants. Another benefit: The universally usable implant was condensed to its essential elements. The treatment process is therefore extremely simple, safe and about twice as fast as with other systems. The implants are sealed directly after insertion with a gingiva former as a healing cap. The screwed and cemented ceramic abutment can later be ground and moulded like a natural tooth inside the mouth—for less appointments, costs and treatment time, and more stability and safety.

New systems usually lack scientific data, a circumstance which makes them easily attackable by sceptics. What can you tell us about the system you use in term of its clinical and scientific evidence?

Dr Kolbe: The system is, of course, clinically tested, certified and scientifically evaluated. The AWI implant system has proven its reliability in various clinical studies (including at Krasnoyarsk State University in Russia); dynamic and static load tests have shown that, with values of up to 500 N, it withstands more than most other systems made of ceramic or titanium; and its breaking forces are demonstrably beyond the values of what bones can endure. The AWI system, which is completely manufactured in Germany, therefore provides a clinically protected, compact and cost-effective implant concept which has already been applied successfully more than a thousand times.

There is also a one-piece AWI implant for the lower anterior region with a diameter of 3.9 mm and two sizes (10 and 12 mm). The system also contains two straight all-ceramic abutments and two all-ceramic abutments at a 15° angle, a steribox and a surgical tray with fibres made of ATZ high-performance ceramic and turning tools.

Thank you very much for this conversation.

contact

WITAR Consulting GmbH
Rodenkirchener Straße 148
50997 Cologne, Germany
www.witar.de