A new concept in ceramic implantology

The team behind Polish ceramic implant system OriCera is convinced that a new era in dental implantology will be dominated by metal-free products and that its implant will soon become the most advanced ceramic implant in the world and will contribute to improving the health and quality of life of patients worldwide. In this interview with *ceramic implants*, Chief Science Officer at OriCera Dr Jarosław Pospiech explains the rationale behind this ambitious view.

What's the back story of OriCera?
Several years ago, I met two engineers—Adam Zdybel, a specialist in nanomaterials, and Przemysław Grycza, a specialist in materials processing—with the requisite knowledge and production facilities who were both enthusiastic about the production and marketing of modern dental implants. OriCera initially had a different name and was intended to create a state-of-the-art titanium implant with a reduced osseointegration period. However, Adam introduced us to the current knowledge on ceramic materials and showed us scientific reports by authors like Curd Bollen, Johann Lechner and Sammy Noumbissi, and we unanimously concluded that ceramics are the future of dental implantology. The clinical and biological reasons for this are obvious. Zirconia ceramics especially have excellent biological and physical properties, such as resilience to bending and abrasion. It is an interesting but also a demanding material for the production of implants. The existing ceramic implant systems try to copy titanium solutions, which we believe is not the best approach.

Where do you see the biggest problems with ceramic implants?
I believe the biggest problem is the insecure connection between the prosthetic component and the implant. In two-piece ceramic implants, many manufacturers use screw connections between the implant and abutment which are usually made of metals or composites. From a technical stance, mechanical connections of elements of different physical parameters, such as hardness, are debatable owing to differing abrasion of the materials over time. There is currently not enough clinical data to conclude that these solutions are really safe. Recently, ceramic screws have been used for connection. However, we also do not have long-term data to prove the effectiveness of this approach. Research has exposed the structure's greatest weakness: the connection between screw, abutment and implant. The accumulation of stress in these places leads to microcracks and, ultimately, implant fracture. In mechanics, screws are usually used for connecting materials with similar strength parameters and with a certain degree of plasticity, like metals or plastics. Ceramics are by nature hard structures with negligible plasticity. After an in-depth market analysis, we decided to develop a screwless, detachable connection without the use of glue or cement. This allows for the removal, placement and eventual replacement of the prosthetic work at any time. The process of removing the crown does not subject the implant to damage by exposure and the formation of areas that initiate rupture. The dentist won't need to invest in expensive equipment, as placing and removing the crown is rather simple. Digital techniques will allow the production of a strength-optimised, stable prosthetic work. Also, in most clinical situations the use of an abutment won't be necessary. In addition, our connection is aesthetically improved.

Apart from the screwless connection that works without the use of glue or cement, are there any other improvements introduced by OriCera?
Our goal is also to reduce osseointegration time. Quick prosthetic restoration is important for patients when planning therapy. Based on my long-term clinical observations on the osseointegration of titanium implants, I am convinced that this is possible with ceramic implants too. The surface of the implant body is obviously very important. In this regard, we have achieved a certain gold standard applied successfully in various implant systems. A micro-rough surface design helps to achieve quicker and more successful osseointegration. I believe that we still do not utilise bone to its full regenerative potential. I would also argue that the surgical technique and to some extent the macro-design of the implant, which we have improved in our project, are decisive in this context. When talking about surface porosity, we also have to talk about peri-implantitis. Research indicates that there is much less inflammation around ceramic implants than around titanium systems. Preliminary clinical reports of spontaneous bone regeneration after cleaning and decontamination procedures around ceramic implants are also interesting. With this in mind, OriCera offers a novel modification of the implant's cervical part that increases its effectiveness and simplifies the treatment of the complications mentioned earlier.

It sounds like your system has great market potential. What stage is the currently project at, and when can we expect it to be marketed?
Our team is made up of carefully selected members, who are highly committed to our project. We have the necessary tools as well as scientific and research contacts to design and process ceramics. The digital models of the implants we have created have undergone a very thorough numerical analysis. They have been optimised in terms of strength and mass production capabilities. We are on the eve of producing prototypes and mechanical testing to ISO standards. We still have a lot of work ahead. In the near future, we will have to make a decision regarding subsequent stages of the project. We are thinking about starting our own production, though we are not excluding an alliance with a big implant company. The latter option would certainly accelerate the commercialisation of the project and market debut.

How did you personally find your way into implantology?
Besides medicine, I have always been interested in micromechanics because of my father, an engineer, who sparked my interest in this field. To be honest, even the most advanced state-of-the-art smartwatch will always lose my interest in favour of a mechanical one. When working at the Poznan University of Medical Sciences in the early 1990s, I joined forces with a colleague for the development of the titanium implant system Osteoplant, which was one of the leading implants in Poland until recently. While making implants and using various brands, I had the opportunity to fuse medical and technical knowledge and draw conclusions as to how technical aspects influence clinical effects, for example the speed of osseointegration. In implantology, I have always tried to combine biological knowledge, surgical art and technology. My expertise has been recognised by several companies in the medical industry, and this has led to the development of infini-Ti sinus grafting kit, a tool for sinus augmentation, and Coreflon PTFE surgical sutures. As for the OriCera system, every idea in it is original, supported by clinical observations and the technical knowledge of a doctor with the ambitions of an engineer. I see OriCera as the essence of 30 years of my work at the interface of medicine and technology, which is why I'd like to develop it to the most thoroughly perfected ceramic implant system on the market. Together with my great team members, Adam and Przemysław, as well as our research partners, I hope to succeed.

OriCera® high-end ceramics implants

about the author

Dr Jarosław Pospiech is a Poland-based oral surgeon who has been actively involved in implantology and bone regeneration techniques since 1991. He has helmed various inventions; for example, he is the co-inventor of the first Polish implant system, Osteoplant. He is active as a clinical researcher on bone grafting procedures and biologically driven fixture design. He currently runs a private dental practice called ImplantPoint with a focus on implantology.

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