Bringing titanium and zirconia together in one implant

In 1992 Prof. Günter Heimke proclaimed in Hamburg: "The goal is to have an implant body made from titanium on the inside, whereas the neck and the over-all shape on the outside are made of ceramics." Now, after more than 25 years, this vision has finally become reality in the form of the hybrid implant from TIZIO Hybrid Implants. But how do you actually bring titanium and zirconia together in one system? And what role do glass solders play here? These are some of the questions that Hamburg-based implant specialist Dr Anders Henningsen, M.A., answers in the following interview with implants.

Dr Anders Henningsen

Dr Henningsen, the hybrid implant from TIZIO Hybrid Implants contains a grade IV titanium implant body with an outer shell made of alumina toughened zirconia (ATZ). In which ways is such an implant different from conventional titanium or ceramic systems?
A hybrid implant combines the advantages of both materials. For example, zirconia provides high aesthetics owing to its white tooth-like colour. Additionally, the hybrid implant possesses an improved tensile strength and it is able to absorb shear forces more effectively than conventional ceramic implants. Thanks to the outer ceramic layer, a significantly higher biocompatibility is achieved compared to conventional implants. Apart from that, the roughness of the implant surface is not achieved by substance removal, as is the case using sand-blasting, for instance. Instead, a glass layer is applied to the surface, which is fired. Using this method, the implant surface is roughened, which promotes osseointegration and tissue healing. The glass matrix adheres to the surface, does not peel off during insertion and is very biocompatible.

> "[…] the hybrid implant possesses an improved tensile strength and it is able to absorb shear forces more effectively than conventional ceramic implants."

The TIZIO implant system is available in two versions: as classic two-piece system (TIZIO F3), which enables implant placement at bone level and covered healing, and as a system with an extended neck made of ceramics (TIZIO H6), which allows implant placement at tissue level. In general, TIZIO offers a wide range of products for a variety of indications.

With titanium and zirconia, the hybrid implant from TIZIO combines the two most prominent implant materials. Which technology is required to bring these materials together in one system?
With the aid of glass soldering, a strong and novel kind of bond is formed between the two materials. Titanium and zirconia are bonded together using glass solders, which diffuse into the materials at high temperatures. The ceramic and metallic materials must meet specific requirements, especially with regard to the CTE value (coefficient of thermal expansion), in order to work in this innovative production method. Alumina toughened zirconia and grade IV titanium have proven to be the most suitable materials.

TIZIO HYBRID IMPLANTS

The Root of the Future

The hybrid implant from TIZIO was designed as two-piece system and is also available with an extended ceramic neck. Which benefits does this offer?
First, there is no need for scalloping or grinding, which is a significant benefit. Moreover, components can be replaced at wish and at any time—when prosthetics need renewing, for example. Additionally, hybrid implants allow clinicians to react flexibly to changes in the patients' clinical situation. Free-hand situations can be mastered easily, crowns are easily removable, bridges can be realised and removable dentures can be anchored. Generally speaking, prosthetic restorations on hybrid implants can be extended or converted at any time.

What are the advantages and challenges with regard to surgical and prosthetic handling?
The implant is easier to handle than a conventional ceramic implant. Thanks to the titanium insert, there is significantly less prosthetic loosening. Additionally, angulation problems can be compensated with abutments, which leads to an increase in stability of prosthetic restorations. During implant insertion, it is important to choose a torque that is not too high. Unfortunately, since reduced-diameter implants are not yet developed to market maturity, the hybrid implant is not suitable for all anatomical situations at this point. There are still technical obstacles to overcome regarding the restoration of narrow tooth gaps with reduced-diameter implants. However, a hybrid implant with a diameter of 3.6 mm is currently being tested. As for prosthetics, ceramic abutments based on the hybrid principle are already in development, too.

> "Thanks to the outer ceramic layer, a significantly higher biocompatibility is achieved compared to conventional implants."

The hybrid concept from TIZIO Hybrid Implants is quite a novelty. Are there any differences to conventional titanium or ceramic implants regarding long-term stability and implant loss rates?
Concerning long-term stability, there are no factors which indicate that hybrid implants from TIZIO might be not as stable as other implants. Statements about implant loss rates are not yet available, however, and studies are still being carried out. Yet, animal experiments required for approval indicate that the hybrid implants are comparable with conventional implants in terms of osseointegration and tissue integration. There are no significant differences between TIZIO Hybrid Implants and a conventional titanium implant, for example.

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