Implant-Supported Fixed Restorations for the Partially Edentulous Arch

By Prof. Gregor-George Zafiropoulos & Assoc. Prof. Moosa Abuzyada, UAE

When restoring a partially edentulous arch with an implant-retained fixed restoration (fixed partial denture, FPDs), several procedural steps may influence the fit and function of the framework. These include: 1) the correct transfer of the implant position, 2) the correct transfer of vertical height and maintenance of the maxillo-mandibular relationship, 3) the determination of an optimal occlusion, and 4) the selection of implant abutments with the correct shaping and angulation. The described method allows the accurate transfer of the implant position and the recording of the interocclusal relationship using transfer key and electroformed gold copings.

Case

A 62-year-old man with a partial edentulism of the left posterior mandible presented for implant placement and prosthetic restoration. Teeth #34–36 had been extracted due to root caries 5 years previously. Two screw cylinder implants (11.5-mm length, 3.75-mm diameter, Straumann, Duesseldorf, Germany) were placed manually at a torque of 25 Ncm in the areas of teeth #19 and #21, following a two-step surgical protocol.

The implants were uncovered 8 weeks after placement, system-specific healing abutments were placed, and a closed-tray impression was taken using a transfer system consisting of a titanium impression post (TImP) and a plastic impression coping (pickup, Dentegris, Fig. 1). For impression, a polyether material (Impregum; 3M ESPE, St. Paul, MN, USA) was used. To ensure that the titanium impression posts remained left on the implants until the interocclusal relationship was recorded (1 day later).

In the dental laboratory, a final master cast was fabricated using system-specific implant analogs and a new set of TImPs (Fig. 2A). The cast was used to fabricate: for fabrication of a transfer key, resin copings were made on top of the TImPs (pattern resin; GC America, Inc., Alsip, IL, USA) and connected to each other using a light-curing resin (ivory pink transparent, Ormocryl, Rodgau, Germany; Fig. 2B). The transfer key was placed on TImPs in patient’s mouth and a bite registration was made and a final impression was taken over the electroformed copings, and the occlusion was checked (Fig. 3). A bite registration was made and a final impression was taken over the electroformed copings and the mock-up using a polyether material (Impregum, 3M ESPE, Fig. 4A). After the impression had been taken, the abutments were left in the patient’s mouth and the temporary FPD from colored PMMA was placed on them using temporary cement (Templokend, Kerr, Orange, CA, USA; Fig. 08B).

In the dental laboratory, a final master cast was made using the mock-up and electroformed copings to transfer the position of the gold implant abutments (Fig. 09A). The metal framework was milled from a CrCo alloy (Zenotec NP, Wieland, Pforzheim, Germany) and veneered with porcelain (Vintage MP; Shofu, Ratberg, Germany; Fig. 09B). After then, the gold copings were fixed into the framework (AGC Ceram, Wieland, Pforzheim, Germany). The final FPD was fixed over the implant abutments using a temporary cement.
the field of ceramic implantology. Noumbissi, about the association’s online spoke with the President and metal-based implants. Dental Tribune and metal free alternatives to metal implants. Implantology (IAOCI) is an association with antiallergenic properties of ceramic implants have positioned dental implants that are made of ceramic compounds, such as alumina or zirconia. They were all monocryostalline in compo-

Discussion

Several clinical steps significantly influence the success of the restoration, including the accurate record-
ing of the interocclusal relationship, the transfer of the correct implant position, occlusal forces and the passive fit of the framework. In the case described in this report used customized implant abutments, pre-fabricated titanium can also be used. However, customized abutments (casted or CAD/CAm milled) allowed the achievement of more ideal angu-
lration, height, diameter, and shape. Such optimization improved the

ability to address problems related to interocclusal and interproximal distances, implant angulation, and related soft tissue responses. Although this report has described the fabrication of a three-unit FPD supported by two dental implants, this technique can also be used for the rehabilitation of larger partially edentulous areas with multiple-unit FPDs retained on more than two implants (Fig 10). The abutments were not removed after mounting and tonguing until the final restora-
tion was fitted and placed. Thus, the position of the abutments remained unchanged, eliminating errors that might occur during repeated attach-
ment of the abutments for various test fittings of the restoration. A proper fit of a restoration requires the accurate transfer of the intraoral implant position to the master cast and a precise fit to the abutment can be achieved with AGCs.24

The use of a mock-up allows not only the evaluation of FPD fit, occlusion, and shape but also the fabrication of an exact final master cast, because the AGCs remain in a fixed position while impressions are taken. Furthermore, any necessary change in shape or occlusion can also be made on the mock-up and transferred to the final denture. Although this technique requires one or two more clinical treatment sessions than other traditional tech-
niques, this does not represent a real disadvantage given the superiority of the final result. The disadvantages of this method include the higher cost and the need for a very skilled laboratory technician.

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Advantages of ceramic implants are numerous. In general, they offer several advantages over traditional metal implants: high biocompatibility, low allergy risk, esthetic advantages, and potential improvements in patient comfort. These implants have been gaining popularity in recent years, and dentists and patients alike are exploring their potential benefits. However, any new technology comes with its own set of challenges, and ceramic implants are no exception. In this article, we will delve into the advantages and disadvantages of ceramic implants, as well as the different types available for use in dental care.

Advantages of Ceramic Implants

1. Biocompatibility and esthetics: Ceramic implants offer superior esthetics compared to traditional metal implants. They are made of materials that are less likely to cause allergic reactions and are also easier to match to patients’ natural teeth. This makes them a popular choice for patients seeking a more natural-looking smile.

2. Durability and longevity: Ceramic implants are highly durable and can last for many years with proper care. They are also more resistant to fracture and wear compared to metal implants, making them a good choice for patients who require longevity in their restorations.

3. Lower risk of infection: Ceramic implants have a lower risk of infection compared to metal implants. This is because they do not have the same metallic components that can become contaminated and lead to infections.

4. Reduced discomfort: Ceramic implants can cause less discomfort during placement due to their smoother surfaces and lower density. This can be especially beneficial for patients who experience pain or discomfort during traditional implant placement.

Disadvantages of Ceramic Implants

1. Expense: Ceramic implants can be more expensive than traditional metal implants due to the complex manufacturing process and materials used.

2. Potential for complications: Ceramic implants can be more prone to complications such as fracture and wear compared to metal implants.

3. Limited availability: Ceramic implants are not yet as widely available as traditional metal implants, which can limit options for patients.

4. Limited indications: Ceramic implants may not be suitable for all patients or all treatment scenarios due to their limited indications and restrictions.

Types of Ceramic Implants

There are several types of ceramic implants available for use in dental care, each with its own unique advantages and indications:

1. Zirconia: Zirconia implants are made from zirconium dioxide and offer excellent strength and esthetics. They can be used in a variety of situations, including single-tooth and all-ceramic restorations.

2. Alumina: Alumina implants are made from alumina, which offers good strength and resistance to wear. They are often used in situations where additional strength is needed, such as in full dental arches.

3. Titanium: While Titanium is commonly used as a base material for metal implants, it can also be used in ceramic implants. This offers excellent strength and biocompatibility.

4. Porcelain: Porcelain implants are made from porcelain materials and offer excellent esthetics. They are often used in situations where a natural-looking smile is desired.

Conclusion

Ceramic implants offer several advantages over traditional metal implants, making them an attractive option for many patients. However, they do come with their own set of challenges and potential complications. Patients and dentists should carefully consider the advantages and disadvantages of ceramic implants before making a decision.

By DTI

Dental Tribune Online: How have ceramic implants progressed since their initial development in the late 1960s? Dr. Sammy Nounbiasi: Ceramic implants were born out of a desire for a material that would appear similar to natural teeth and be just as functional. They were a response to early concerns about the long-term stability and health effects of metal alloys being embedded in bone and exposed to the oral environment. Early ceramic implants were mostly made of one ceramic compound, such as alumina or zirconia. They were all monocryostalline in composi-

Alumina was prone to fracture and zirconia displayed low temperature degradation and poor suitability to the high humidity in the oral envi-

ronment. Starting in the mid-1980s, advances in manufacturing and technology led to the development of ceramic composites. These composites were made by combining specific and different bioceramics that were known to have unique physical and chemical properties. These advances created new and more structurally stable polycrystalline bioceramics with greatly improved functional properties. This is how we developed dental implants that are made of ce-

ramic composites, such as alumina-

magnified version of the text.}

Interview: “The future of ceramic implants is really bright for many reasons”

What are some of the issues associated with metal implants, and are these negated with ceramic implants?

Metal implants are well researched, documented, and have been very successful. There is a multitude of implants on the market and with that has come along different manufacturing protocols. As a result, we have observed a steady increase in alloy elements added to titanium in order to improve its physical proper-
ties. The problems begin when the metal implant, highly alloyed or not, is subjected to functional stresses, galvanism, body fluids and the harsh
oral environment. Gallium is the most important, but often ignored problem. All dentists are taught in dental school not to mix dissimilar metals in the oral cavity—nevertheless, this rule is consistently violated with implants. We have implants connected to all kinds of alloyed abutments, screws, cements and cip- tings even when they come from the same manufacturer. Gallnic corro- sion occurs and studies have shown that in the process, metal ions get released into the surrounding soft tissues; bone, lymph nodes and even distant organs. Corrosion also come from mechani- cal functional stresses that induce cracks and pitting of the metal and biological degradation by the body. Ceramic implants, alternately, do not conduct electricity or heat, are non-corrosive and retain very little biofilm and plaque in comparison to metals. Furthermore, studies have also shown better vasculatization, self-tissue health and apposition with zirconia in comparison to tita- nium.

What is the success rate of ce- ramic implants? Ceramic implants today, in my experience and for many fellow ceramic implantologists, have the same success rate as titanium implants. They are now as versatile as metal implants thanks to the evolution in design, surface enhancement proto-cols and biomaterial improvements. Various treatment modalities are ap- plicable with ceramic implants. Im- mediate placement, immediate tem- porary, full arch and full-mouth rehabilitation can be performed with excellent and predictable outcomes. I, however, believe that adopting ceramic implantology should be accom- panied by a minimum amount of training or shadowing from an ex- perienced clinician, even if one has experience with titanium implants. Given that ceramic implants are a viable alternative to titanium, why do many den- tal professionals still regard them with skepticism? The early study of ceramic implants were so difficult and controversial so much so that a stigma regard- ing their viability and functionality still persists. I would rather ask this question: “Why aren’t there more dentists placing ceramic implants despite evidence of their viability?” This is the case for a few reasons. Metal implants have a very strong background and the cost of manu- facturing zirconia is still pretty high. All of the major implant manufac- turers (with the exception of Implant Direct) do not have a ceramic implant on the market, let alone in development. Furthermore, the cost of production and pricing of titani- um implants have decreased, mak- ing them more accessible to dentists and patients. I would also add that dental mater- ials are evolving very fast and dental schools and graduate programs are lagging in educating their students on the capabilities and applications of these new materials. I often have conversations with dental academ- ics, professors and new graduates and unfortunately, for the most part, there is a distorted view and misun- derstanding of zirconia. To many, accepting zirconia as a restorative material is an easier exercise than reorganizing it as an implant and im- plantable material, but I have seen this changing rapidly over the last couple of years. Where do you see the field of ceramic implantology heading? The future of ceramic implants is certainly bright for many reasons. Pat- ients increasingly ask for safer, less invasive solutions, as well as metal-free alternatives for teeth repair or replacement. Dental attitudes and understanding of zirconia and bi- oceramics are slowly, but steadily evolving, with a definite shift toward biological and inert materials. There has also been a shift in the healthcare industry towards wellness, wellbeing and providing therapies that have little to no side effects. As I previ- ously mentioned, some of the largest manufacturers in the implant industry are incorporating or have already adopt- ed ceramic implants in their product line, either by development or by corporate acquisitions. A quiet, but major shift is happening in implant dentistry. What prompted you to es- tablish the IAOCI? The IAOCI was created to provide a platform where ceramic implant acceptors and believers can exchange ideas, experiences and engage in clinical and scholarly conversation. The other primary objective was to reach out and help our colleagues better understand bioceramics and realize that metal-free implants are a viable and proven alternative. With the help of our supporters and through our other educational activi- ties, we plan to establish a research fund in 2017 to support graduate dental students and residents who elect to conduct projects involving ceramic implants. The IAOCI will be hosting its Sixth Annual World Congress in Miami, Florida. What can dental professionals expect from the event? We are fortunate, honored and privi- leged to have Prof. Sami Sandhaus, a pioneer and forefather of ceramic implantology, as our keynote speaker. The theme of our congress in February 2017 is “Evidence-Based Ce- ramic Implantology – Where Are We Today?” For three days, the congress will host a gathering of the world’s foremost authorities in ceramic im- plantology and dental bioceramics. Our speakers will share data gath- ered over 10, 15 and even 20 years re- garding ceramic implants. They will also cover zirconia as an implant ma- terial, its behavior under function, its biocompatibility, immunocompat- ibility and superior hygiene properties, and the lack of galvanic activity, corrosion and ion release in ceramic implants. We will also be offering surgical and prosthodontic workshops on implant systems from the top three indus- try players. This is a great opportu- nity for current users, non-users and even skeptics to come and listen to 15 world-renowned and published ex- perts present and share their experi-ences and expertise around ceramic implants. Thank you for the interview.

Given that ceramic implants are a viable alternative to titanium, why do many den- tal professionals still regard them with skepticism? The early study of ceramic implants were so difficult and controversial so much so that a stigma regard- ing their viability and functionality still persists. I would rather ask this question: “Why aren’t there more dentists placing ceramic implants despite evidence of their viability?” This is the case for a few reasons. Metal implants have a very strong background and the cost of manu- facturing zirconia is still pretty high. All of the major implant manufac- turers (with the exception of Implant Direct) do not have a ceramic implant on the market, let alone in development. Furthermore, the cost of production and pricing of titani- um implants have decreased, mak- ing them more accessible to dentists and patients. I would also add that dental mater- ials are evolving very fast and dental schools and graduate programs are lagging in educating their students on the capabilities and applications of these new materials. I often have conversations with dental academ- ics, professors and new graduates and unfortunately, for the most part, there is a distorted view and misun- derstanding of zirconia. To many, accepting zirconia as a restorative material is an easier exercise than reorganizing it as an implant and im- plantable material, but I have seen this changing rapidly over the last couple of years. Where do you see the field of ceramic implantology heading? The future of ceramic implants is certainly bright for many reasons. Pat- ients increasingly ask for safer, less invasive solutions, as well as metal-free alternatives for teeth repair or replacement. Dental attitudes and understanding of zirconia and bi- oceramics are slowly, but steadily evolving, with a definite shift toward biological and inert materials. There has also been a shift in the healthcare industry towards wellness, wellbeing and providing therapies that have little to no side effects. As I previ- ously mentioned, some of the largest manufacturers in the implant industry are incorporating or have already adopt- ed ceramic implants in their product line, either by development or by corporate acquisitions. A quiet, but major shift is happening in implant dentistry. What prompted you to es- tablish the IAOCI? The IAOCI was created to provide a platform where ceramic implant acceptors and believers can exchange ideas, experiences and engage in clinical and scholarly conversation. The other primary objective was to reach out and help our colleagues better understand bioceramics and realize that metal-free implants are a viable and proven alternative. With the help of our supporters and through our other educational activi- ties, we plan to establish a research fund in 2017 to support graduate dental students and residents who elect to conduct projects involving ceramic implants. The IAOCI will be hosting its Sixth Annual World Congress in Miami, Florida. What can dental professionals expect from the event? We are fortunate, honored and privi- leged to have Prof. Sami Sandhaus, a pioneer and forefather of ceramic implantology, as our keynote speaker. The theme of our congress in February 2017 is “Evidence-Based Ce- ramic Implantology – Where Are We Today?” For three days, the congress will host a gathering of the world’s foremost authorities in ceramic im- plantology and dental bioceramics. Our speakers will share data gath- ered over 10, 15 and even 20 years re- garding ceramic implants. They will also cover zirconia as an implant ma- terial, its behavior under function, its biocompatibility, immunocompat- ibility and superior hygiene properties, and the lack of galvanic activity, corrosion and ion release in ceramic implants. We will also be offering surgical and prosthodontic workshops on implant systems from the top three indus- try players. This is a great opportu- nity for current users, non-users and even skeptics to come and listen to 15 world-renowned and published ex- perts present and share their experi-ences and expertise around ceramic implants. Thank you for the interview.

Interview: “Implant failure is a failure for both the dentist and the patient” By Marc Chalupsky, DTI Originally from Syria, Dr. Iyad Es- tony obtained his master’s degree in fixed and removable prosthodontics in France before moving to Dubai in 1997. An implantologist and general dentist at GMC Clinic in the heart of Dubai, Estony also focuses on pros- thodontics and aesthetic and laser dentistry. In an interview with Den- tal Tribune Middle East, the implant specialist spoke in favour of proper oral health and individual prophylaxis training, two areas of dental care that are essential for long-term implant success.

Dental Tribune Middle East: You are originally from Syria. How was the dental training at your school? Dr. Iyad Estony: I received my DDS in 1991 from Tishreen University in Syria. There are four dental schools in Syria, along with many practitioners. A number of Syrian dentists have moved to the UAE because of their good dental knowledge and the fact that dental education is still excellent in Syria. Can you summarise the state of oral health in Dubai? As Dubai is a multicultural city, one sees problems from all over the world. Some patients are highly mo- tivated in terms of their oral hygiene, while one has to put in a great deal of effort with some others. In terms of oral hygiene, I have seen that peo- ple have started to become aware of dental problems and products. In the last few years, people have become more focused on beauty and aesthet- ics, which in turn has led to a higher interest in healthy teeth. We also have an overwhelmingly young population in this country; consequently, there are only a few older dentists here. Eighty per cent of expats are young. This means that one does not see any advanced periodontal problems, but one does increasingly see stress-related bru- zion, which in turn leads to periodontal problems.

How would you evaluate the market for oral hygiene in this region? The market here is competitive and small. We do not sell the products, but give it to patients. If they like it, they can buy it at the pharmacy. This has worked well. For us, it is impor- tant to ensure that patients have the correct interdental brush size. This means that we tell them what size they need. A dental hygienist or peri- odontist usually gives instructions and explains everything. One always needs to determine the correct sizes and give proper instructions. As an implant specialist, what do you think about prevention? There does not seem to be a strong connection between implantology and prevention at first, but just look at the problem of peri-implantitis. One needs to treat peri-implantitis as a bacterial problem and thus one must give clear instructions for cleaning, which involves interdental brushes and mouthwashes. Prevention is always the golden rule for any implant. If I do not see good oral hy-
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**IMPLANT TRIBUNE**

**VERSAILLES DENTAL CLINIC**

New implant releases antimicrobial drugs to fight infections

By DFI

LEUVEN, Belgium: Bacterial and fungal pathogens can form a biofilm on dental implants that is resistant to antimicrobial drugs like antibiotics. As a result, these implants pose a significant risk to the patient's health. A multidisciplinary team of researchers at KU Leuven in Belgium has developed a dental implant that gradually releases such drugs from an integrated reservoir. The antimicrobial liquid could help prevent and fight infections.

“Our implant has a built-in reservoir underneath the crown of the tooth,” explained lead author Dr. Kaut De Cremer. “A cover screw makes it easy to fill this reservoir with antimicrobial drugs. The implant is made of a porous composite material, so that the drugs gradually diffuse from the reservoir to the outside of the implant, which is in direct contact with the bone cells. As a result, the bacteria can no longer form a biofilm.”

In the laboratory, the implant was subjected to various tests for use with chlorhexidine, a universal mouthwash with a powerful antimicrobial effect. The study shows that the streptococcius mutans bacterial, a major contributor to tooth decay, is prevented from forming a biofilm on the surface of the implant when the reservoir is filled with the mouthwash. Furthermore, biofilms that were grown beforehand on the implant could be eliminated in the same way. This indicates that the implant would be effective in terms of both preventing and curing infections. This study titled “Controlled release of chlorhexidine from a mesoporous silica containing macroporous titanium dental implant prevents microbial biofilm formation”, was published online in January in Volume 35 of the European Cells and Materials journal.

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