Implant-Supported Fixed Restorations for the Partially Edentulous Arch

By Prof. Gregor-Georg Zafiropoulos & Assoc. Prof. Moosa Abuzayda, 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 #14–16 had been extracted due to root caries 5 years previously. Two screw cylinder implants (straight line, 3.75 mm diameter, 11.5 mm length, Dentegris, Duisburg, Germany) were placed manually at a torque of 35 Nm 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 (TIPm) 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 in the exact same position, they were 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 TIPm (Fig. 2A). The case was used to fabricate: For fabrication of a transfer key, resin copings were made on top of the TIPm (pattern resin, GC America, Inc., Alsip, IL, USA) and connected to each other using a light-curing resin (tray pink transparent, Omnident, Rodgau, Germany; Fig. 0B). After the impression was taken over the electroformed copings, and the occlusion was checked (Fig. 1A). A bite registration was made and a final impression was taken over the electroformed copings and the mock-up was scanned, and a mock-up from clear poly(methyl methacrylate) (PMMA) was placed over the electroformed copings, and the occlusion was checked (Fig. 1B). The master cast with the mounted implant abutments and AGCs in place was scanned, and a mock-up from clear poly(methyl methacrylate) (PMMA) was placed on TIPm (pattern resin, GC America, Inc., Alsip, IL, USA) and connected to each other using a light-curing resin (tray pink transparent, Omnident, Rodgau, Germany; Fig. 2A).

At the next clinical session, the implant abutments were mounted on the implants using the transfer key and torqued to 35 Nm, the AGCs were placed on the abutments (Fig. 3A) and the fit of the abutments was assessed with x-rays (Fig. 4). The mock-up from clear PMMA was placed over the electroformed copings, and the occlusion was checked (Fig. 5). 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 (Tempbond; Kerr, Orange, CA, USA; Fig. 4B).

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. 1A). The dental framework was milled from a CrCo alloy (Zenotec NP, Wieland, Pforzheim, Germany) and veneered with porcelain (Vintage MP, Shofu, Ratingen, Germany; Fig. 2B). After then, the gold copings were fitted into the framework (AGC Ceram, Wieland, Pforzheim, Germany). The final FPD was fixed over the implant abutments using a temporary cement.
Several clinical steps significantly influence the success of the restoration, including the accurate recording of the interocclusal relationship, the transfer of the correct implant position, occlusal forces and the passive fit of the framework.1 In the case described in this report used customized implant abutments, prefabricated titanium can also be used. However, customized abutments (casted or CAD/ CAM milled) allowed the achievement of more ideal angulation, 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 retention on more than two implants (Fig 10). The abutments were not removed after mounting and tonguing until the final restoration was fitted and placed. Thus, the position of the abutments remained unchanged, eliminating errors that might occur during repeated attachment of the abutments for various test fittings of the restoration. A proper fit of a restoration requires the accurate transfer of the introral implant position to the master cast and a precise fit to the abutment can be achieved with AGCs.20 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 techniques, 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.

References
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Discussion
Snoqualmie, WA, USA).

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

By DTI

When it comes to materials used in implantology, titanium and titanium alloys have always been the material of choice. However, recent advancements in the functionality of ceramic implants have positioned them as a viable, metal-free alternative with wear-resistant properties and greater aesthetic appeal. The International Academy of Ceramic Implantology (IACI) is an association entirely dedicated to ceramic and metal free alternatives to metal-based implants. Dental Tribune Online spoke with the President and co-founder of the IACI, Dr. Sammy Noumbsi, about the association’s mission, as well as current trends in the field of ceramic implantology

Dental Tribune Online: How have ceramic implants progressed since their initial development in the late 1960s?

Dr. Sammy Noumbsi: 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 monocrystalline in composition and were initially found to be vulnerable to functional stresses or premature structural breakdown. Alumina was prone to fracture and zirconia displayed low temperature degradation and poor suitability to the high humidity in the oral environment.

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 advancements created new and more structurally stable polycrystalline biozircons with greatly improved functional properties. This is how we developed dental implants that are made of ceramic composites, such as alumina-toughened zirconia and hot isostatically pressed yttria-stabilized zirconia. In terms of design, the early implants, for the most part, were one-piece designs. This was because during the initial testing of the implants, structural failures migrated to the connection area between the implants and the abutments. Around 2014, ceramic implant manufacturers started releasing two-piece cemented zirconia implants. This signaled a new era in ceramic implantology, because the flexibility that was once only available with titanium implants had finally come to ceramic implants. More recently, two-piece, screw-retained ceramic implants with metal and metal-free screws have been developed, no longer limiting them to cementable restorative options.

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 properties. The problems begin when the metal implant, highly alloyed or not, is subjected to functional stresses, galvanism, body fluids and the harsh

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Interview: “Implant failure is a failure for both the dentist and the patient”

By Marc Chalupsky, DTI

Dr. Iyad Estoiny: I received my BDS in 1991 from Tishrern 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 oral health education is still excellent in Syria.

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, as it is important to ensure that patients have the correct interdental brush size. This means that we tell them what size they need. A dental hygienist or periodontist 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-implants. One needs to treat peri-implants 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-
New implant releases antimicrobial drugs to fight infections

By DTI

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. 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 streptococcus mutans bacteria, 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 nano-capsular titanium dental implant prevents microbial biofilm formation,” was published online in January in Volume 35 of the European Cells and Materials journal.

How do you deal with implant failure?

Implant failure is a failure for both the dentist and the patient. It is a headache for dentists, and in the worst case, patients will not be able to enjoy a beautiful smile. Periodontal treatment and oral hygiene are important before and after every implant placement. Before and after surgery, I usually explain oral hygiene and motivate my patients. Just recently, I placed an implant in an 84-year-old patient. Six months after placement, I have seen improvement owing to interdental brushes.

Oral hygiene treatment is mostly taken care of by dental hygienists. Most larger clinics employ at least one dental hygienist, and it seems that Dubai citizens make extensive use of them. Is there a good partnership between hygienists and dentists?

There is very good cooperation. I am not interested in cleaning and my dental hygienist is not interested in placing implants. We are both happy to do our work. The profession of dental hygienist does not exist in some countries, such as in France, where I lived for a long time. There, the dentist cleans and polishes for 10 minutes. Here, our appointments last for 45 minutes. We explain to the patient how to perform the necessary post-operative care.

How do you explain it usually?

We simply show them how to brush their teeth and interdental spaces properly. If one just prescribes a certain toothbrush to patients on a piece of paper without instructing them, they will likely go to the pharmacy and buy a different one. If you give it to them, let them try it and help them use it correctly, the possibility of the patients buying the correct brush is higher.

You completed a programme on individually trained oral professionals (ITOP).

What was your impression?

I did the ITOP programme a year ago. Although I liked the programme a great deal, we have still seen that not all patients take the time and really apply what they have learnt. Some patients are really motivated and sit down with us to learn more about oral hygiene. The dentist and dental hygienist then work together. In today’s fast-paced world, we need to take care of individual prophylaxis. For dental hygienists and dental students, ITOP gives dental professionals a gradual awareness of how to provide oral hygiene for their patients. I think that ITOP for students will work well for future dentists.

Thank you very much for the interview.

By DTI

The Faculty are as follows:

Dr. Shanker Iyer, USA Director, AAID Maxi-Course®RIKE, Diplomate ABOI, Diplomate American Board of Oral Implantology, Diplomate American Board of Oral Implantology.

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