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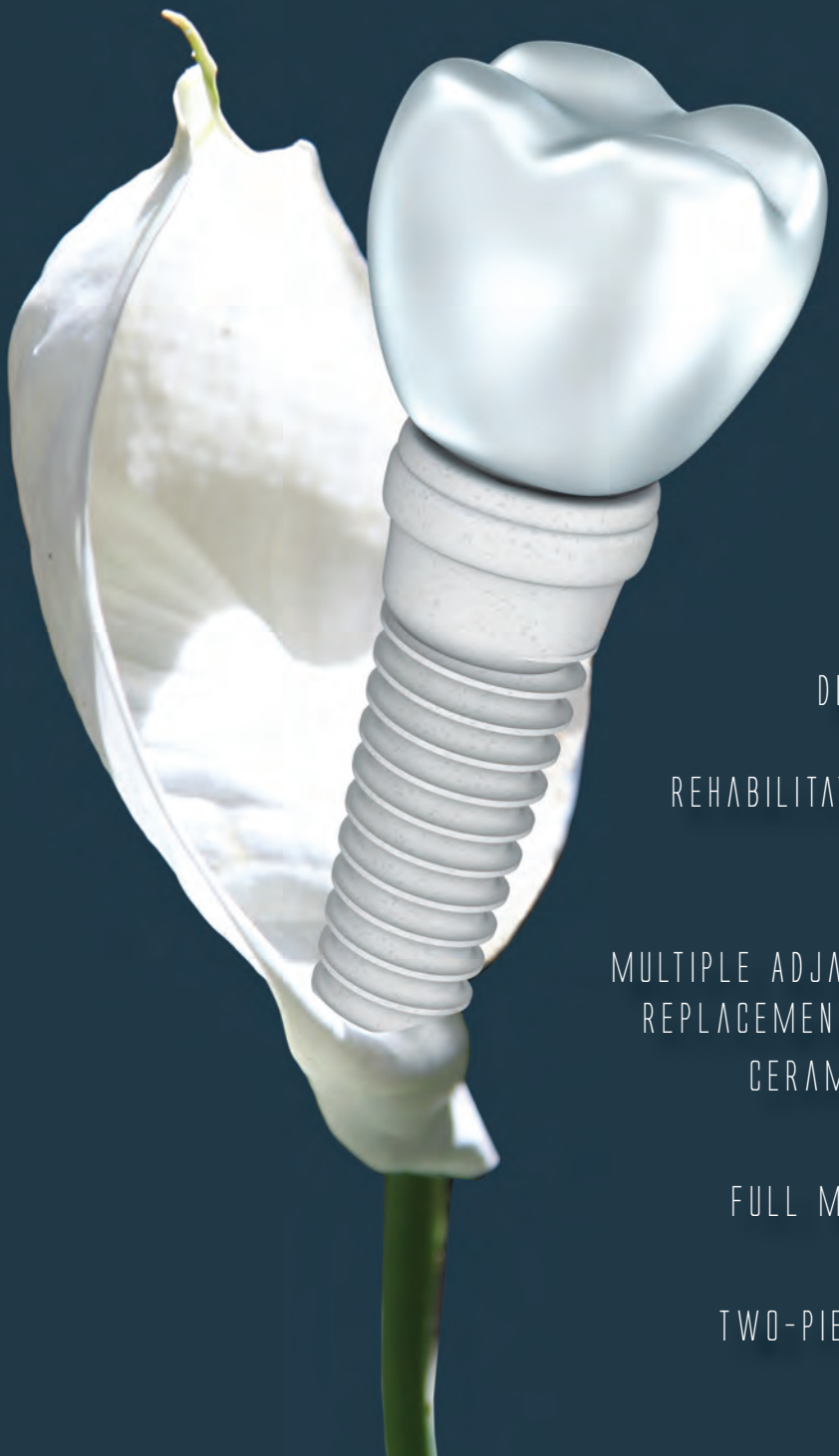
THE JOURNAL OF CLINICAL & PRACTICAL ORAL IMPLANTOLOGY

2019



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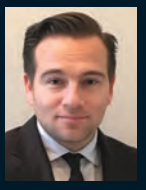
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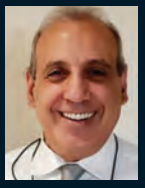
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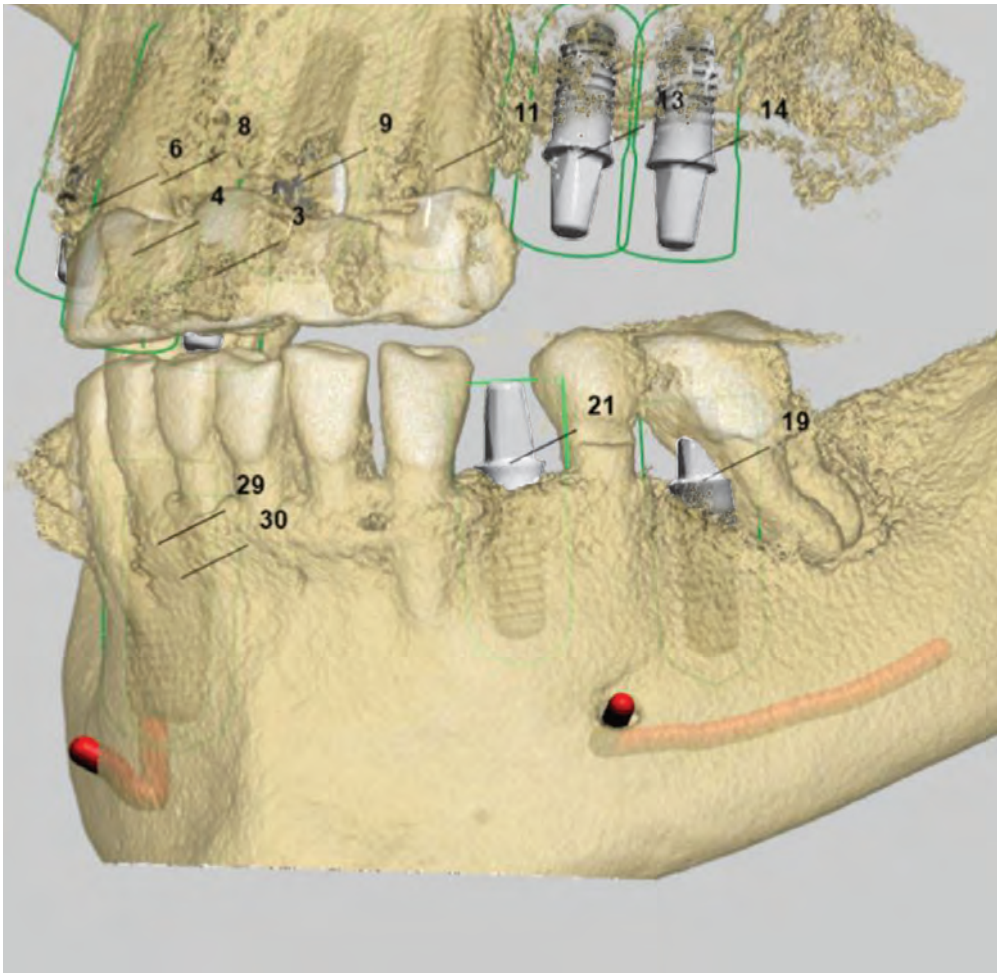
A New Era in Implant Dentistry

Sammy S. Noumbissi,
DDS MS

Restoring form, function and aesthetics have been the pillars of dentistry. An aesthetic smile along with the ability to eat significantly impacts a person's social, physical and emotional life. The search for viable means of teeth replacement and preservation has been an ongoing quest in human history. Archeological findings dating back from ancient China, Egypt and Mayan civilizations show that efforts to replace teeth is by no means a modern phenomenon. The materials utilized over millennia to replace teeth have also evolved from basic materials such as bamboo pegs, wooden wedges, sea shells, ivory to various metal alloys and composite materials.

The earliest evidence of osseointegrated dental implants was identified in the Mayan population dating back to around 600 AD where sea shells were used as implants and were proven to have successfully osseointegrated in the mandible. Modern implantology as we know it and practice today has its roots in the early twentieth century with various macroscopic designs and mostly made of metal alloys of different compositions. Research conducted during the 1950's by Prof. Branemark, Dr. Linkow and others confirmed the viability of titanium as an implant and implantable dental material. In 1965 Brånemark who coined the term "osseointegration" placed his first pure titanium dental implant into a human jaw and for the next fifty years titanium implants revolutionized dentistry, evolved significantly and have enjoyed great success.

These original implants have undergone significant changes both at the macroscopic and microscopic level since Brånemark. Developments such as thread designs and surface modification treatments, alloying with other metals have all taken place with the objective of improving the physical, chemical, biological properties and their behavior in human jawbone and oral environment. As a matter of fact, coating of dental implants with bioactive ceramic coatings such as hydroxyapatite begun in the early 1990's.



The quest for alternative implant materials has never stopped and has intensified with the pursuit of higher aesthetics, increasing reports of metal sensitivity and mounting evidence that titanium and titanium alloys are not as biologically stable and inert as initially thought.

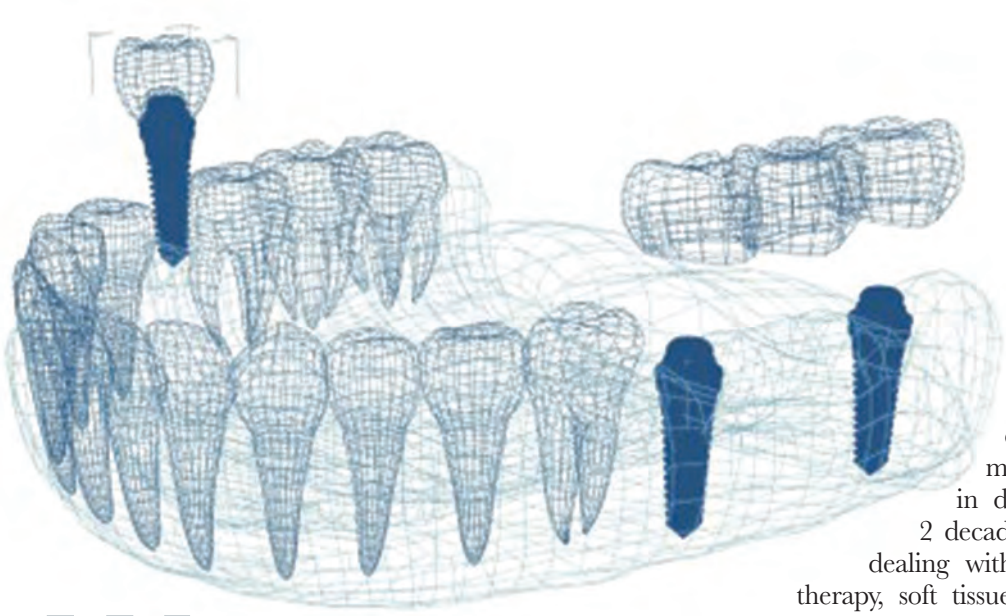
In the mid-60's, Prof. Sami Sandhaus developed the Crystalline Bone Screw (CBS) implant which was monocrystalline and made from aluminum oxide (alumina) and is widely looked upon as the first commercially available modern ceramic implant. In 1975 Dr. Thomas Driskell introduced the Synthodont alumina ceramic implant. Other commercially available ceramic implants subsequently came about such as the Sapphire implants from Kyocera and the Tübingen ceramic implant. However, given their monocrystalline composition they responded poorly to the harsh conditions and demands of the oral environment.

By the early 2000's ceramic materials technology matured to the point where it was now possible to have ceramic composites. Ceramic implants were now manufactured with other ceramics in order to achieve better aesthetics, but also similar or better physical and biological properties compared to metal alloy implants. At the same time patients have increasingly taken ownership of their wellbeing and the type of healthcare they choose to receive; they have been asking for less invasive procedures, materials and treatment modalities both in medicine and dentistry.

In the last ten years we have seen ceramic implants claiming their place in dental implantology. Manufacturers and dentists have responded well to patients requests and concerns so much that in less than a decade we have evolved from one-piece ceramic implants to two -piece implants and in some cases with metal free abutment connection screws. The major implant manufacturers now have ceramic implants in their portfolio, and some have simply resorted to OEM manufacturing in order to fast track their presence in the ceramic implant market. Ceramic implants still do not have the broad range of prosthetic options their titanium counterparts have. However they have become versatile and reliable enough to be used in most clinical situations. This special edition of Spectrum Implant Magazine on ceramic implantology was put together to share with the reader clinical case presentations of different ceramic implants systems in a wide range of clinical applications. ■

What is the big deal?

Dr. Dan Hagi,
DDS, FAGD, FICOI,
(A)FAAID



What is the big deal about Ceramic Implants? After all, have we not been implanting titanium and alloys for over half a century in dentistry with clinical success? When it comes to clinical success, is there anything better than progress and material innovation that yield alternatives to current dogma?

Let me be clear in saying that my 7 years of experience with ceramic implants have proven to show that there is an alternative to titanium. An alternative that our patients are seeking and the industry is recognizing as we see the types of ceramic implants on the market rising year by year and currently number at about 20 in North America and over 30 in Europe.

It is important to recognize that the field of titanium implants and osseointegration started in the 1950's and took almost 3 decades to be recognized by the broad dental profession. In the infancy of dental implantology the support of the industry and the efforts of the pioneers, Branemark, Alberktsson, Adell, Lindhe, Zarb, Schroeder, Buser all formed the basis of dental implantology. It took years for these "heretics" to demonstrate the validity of these concepts and through the rigour of science the profession adapted and accepted that titanium was to become the treatment of choice for the completely edentulous patient and as an extension the partially edentulous.

Throughout the 80's and 90's we saw improvements in implant materials, designs and protocols that make dental implants amongst the most predictable treatments in dentistry. However the last 2 decades have seen a focus that is dealing with complications of implant therapy, soft tissue complications, mechanical complications and peri-implant disease.

We are now reaching the 20 year mark with ceramic implant use worldwide and the recognition of the viability of the material. What we are lacking, and need to initiate, is the publication of basic science and clinically based prospective and retrospective trials that will establish the clinical validity and current protocols and push innovations in implant design, surface treatments and establish new clinical protocols. We need the same rigour titanium received to establish and drive the viability of ceramic implantology and validate though science what we, the "heretics" of today, see daily in practice.

We have gathered in this inaugural special issue case reports from the young pioneers, "heretics", that like the pioneers of the past will prove that innovation is paving the way to new dogma. These reports are showing what everyday clinicians are doing and the outcomes that can be attained. With cases involving one-piece and two-piece ceramic implants and after single and multiple tooth extraction, single implant crowns and full arch rehabilitations, this issue will highlight the breadth of applications seen today. It is from these cases that larger trials and systematic reviews and new literature will flourish. It is my mission to educate and bring this new branch of implantology to the hands of clinicians that want to offer patients an alternative to the traditional tooth replacement. ■

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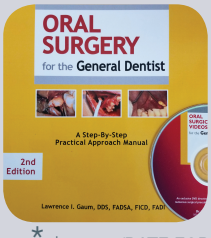

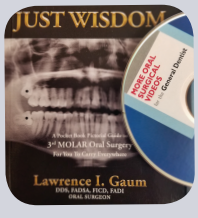

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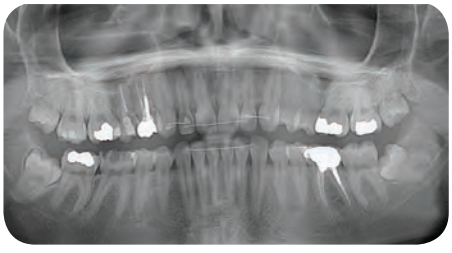

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Digital Workflow for Posterior Maxillary Rehabilitation with Monoblock Zirconia Implant

Saurabh Gupta, BDS MDS

This case study records the single–piece zirconia implant as a replacement for failed endodontic treatment of first maxillary molar tooth. The procedure started with atraumatic extraction of molar tooth and followed by immediate placement of monoblock zirconia implant. Good primary stability was achieved and the zirconia implant was restored with zirconia crown after 6 months. Follow up after a year disclosed success in osseointegration with optimum form and function.

Introduction

The search and innovation on oral implantology has been on the rise despite the existence of the titanium implant option. The reason for this need for alternatives is due to the increase in titanium allergy reports, as well as the demand for higher aesthetic standards and for metal-free reconstructions. This eventually resulted to the proposal for the use of advanced ceramics as possible replacement [1]. The evolution of the industry of zirconia has opened the advanced treatment alternatives for implant dentistry. In comparison with other ceramic-oxide types, zirconia displays outstanding mechanical and biochemical properties [2]. Since it has been introduced in the dental industry, zirconia, has been used as fundamental material suited for dental all ceramic crowns and dental implants together with metal-free abutments. Zirconia is highly suited to be used for dental prosthesis because of its material properties and it has a natural tooth-like colour. Additionally, human studies have shown reduced bacterial adhesion on zirconia than on titanium [3-5]. Zirconia exhibits fewer inflammatory cells in peri-implant soft tissue, as well. Hence, this leads to minimal chance of peri-implantitis to occur in a zirconia implant [6,7].

Fig. 1

An organized review study recently conducted showed survival rate of 95% of one and two piece zirconia implants[8]. Based on this assessment, the marginal bone loss and survival values of one and two-piece zirconia implant is quite acceptable. Also, it must be highlighted that there is lack of data specifying the outcome of the zirconia dental implants in the long run research studies.

Thus, with time it has become essential to conduct more research and clinical studies for obtaining additional information and long term data. In this context, a case study is also valuable for identification of risk factors for biological and technical complications.

Initial Situation

A female patient (21 years old) came complaining about her molar tooth in the upper right jaw being fractured [Fig. 1].

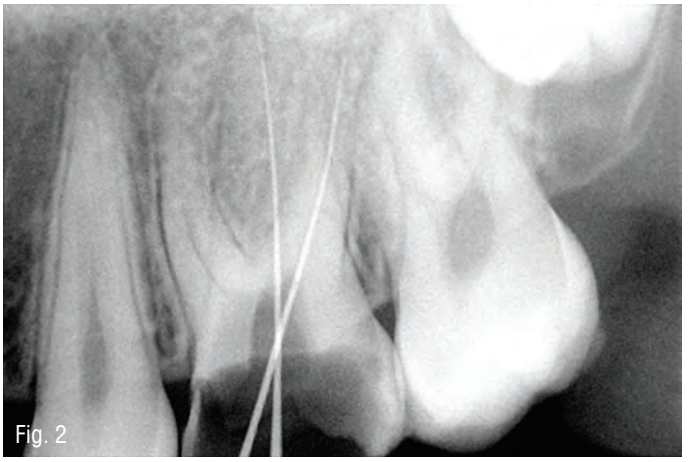
Fig. 2


Fig. 3

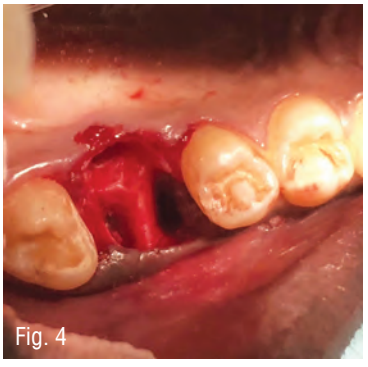
Fig. 4


Fig. 5

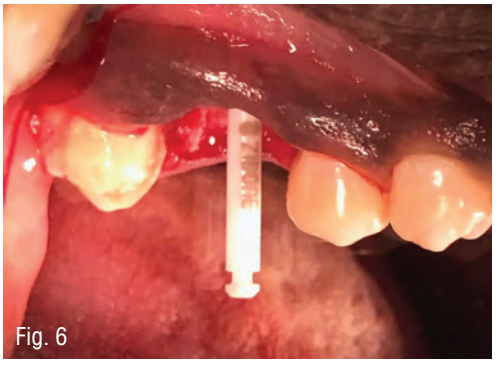
Fig. 6

The patient was quite healthy and a non-smoker. Her tooth was partially endodontically treated and was not restored since a year. According to clinical assessments there was little pain during percussion. Peri-apical radiograph was performed to conclude the examination and it revealed unsuccessful treatment of root canal with root perforation [Fig. 2]. Patient was looking for a metal free option and agreed to undergo extraction followed by immediate zibone zirconia dental implant placement.

Surgical Procedure

Extensive maintenance and ultra-sonic scaling was performed before the tooth extraction and the placement of zirconia dental implant. Under 1:200000 adrenaline in local anesthetic, atraumatic extraction surgery was performed with the use of a periotome for the removal of the failed root canal-treated tooth [Fig. 3]. Extraction space was exhaustively debrided with the use of bone currettes. Manufacturer's instructions have been followed in the preparation of implant bed [Fig. 4]. For the preparation and maintenance of straight vertical position for zirconia implant, implant indicators have been used [Fig. 5,6]. Zibone zirconia implant (COHO Biotechnology) with 4mm diameter and 11.5mm length and about 4mm abutment height was placed immediately with optimal stability (35N) after the atraumatic extraction [Fig. 7]. Bone cement (Augma Biomaterials) was used for filling the extraction void between bone and implant and covered further with collagen membrane to enhance vestibular contour ridge for a more natural looking crown [Fig. 8,9]. The site was approximated with suture 3-0 black silk material [Fig.10] and radiograph was taken [Fig. 11]. Prescriptions included pain killers, antibiotics and betadine mouthwash, and homecare postoperative instructions were also given. After seven days, the sutures were then removed, at that time there was sufficient visible wound healing. Additionally, a PMMA tentative restoration was fabricated and given straightaway after the removal of suture [Fig. 12].


Fig. 6

Digital and Prosthetic Phase

The osseointegration procedure was successful and the implant was planned for the restoration using Lava 3M zirconia

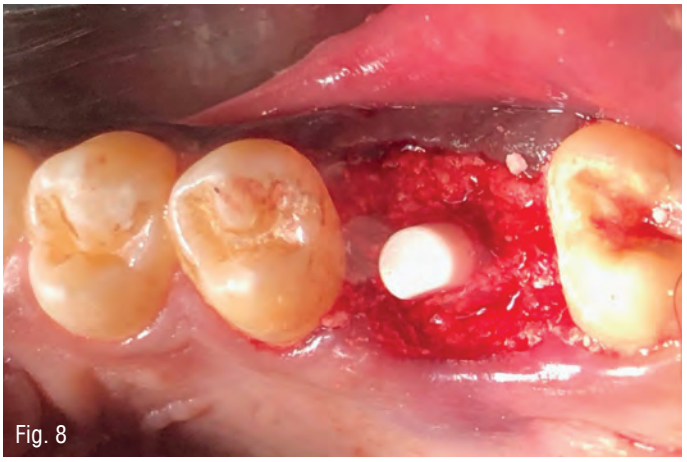
Fig. 8


Fig. 9


Fig. 10


Fig. 11

17,18]. Extra cement was carefully removed with the use of dental floss soon after the final crown cementation [Fig.18]. The crown occlusion was checked with articulating paper of 12microns thickness [Fig. 19].

Appointments of control and maintenance were fixed at six months and one year follow up. The crown implant remained functional and


Fig. 12


Fig. 13

crown after six months [Fig. 13,14]. The abutment part was prepared with the use of Magic-Touch burs (Strauss & Co.) and a 3shape trios intra-oral optical scan was directly taken on the mono-bloc zirconia's abutment portion [Fig. 15,16]. Zirconia implant restoration intaglio surface was cleaned and primed with double coating of Z-Prime plus (Bisco) and cementation was done with 3M ESPE resin self-adhesive cement [Fig. no technical complications were seen during the said time frames. The soft tissue that surrounds the implant was seen to be quite healthy. One year after the placement of the zirconia implant the surrounding bone remodelling was normal with a stabilized bone boundaries [Fig. 20]. The patient was satisfied with the treatment procedure with respect to function and aesthetics.

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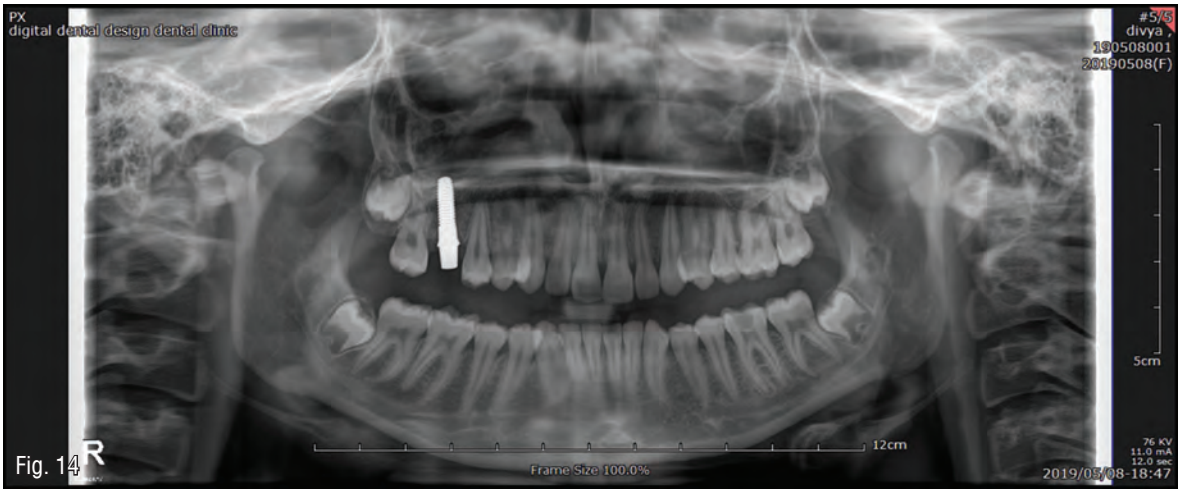

Fig. 14

Conclusion

There was no record of any biological or technical complication one year after the function. Therefore, it has been concluded that zirconia implant usage was a suitable option for titanium implant alternative. The surrounding soft tissue on the implant crown after placement was stabilized and exhibited superior zirconia bio-ceramics biocompatibility. The vertical position of the zirconia implant is a vital factor for the success of the said implants because the implant's soft tissue collar should be positioned apically at a certain depth that permits for the development and attachment of soft tissue going towards the restorative platform. Since it was a single-piece implant, the restoration process requires cementation, and this means there was possible risk of extra cement to be retained sub-gingivally, which could lead to complications like bone loss or implant failure. Further clinical studies are needed for the long-term zirconia implant success rate evaluation. ■


Fig. 15


Fig. 16

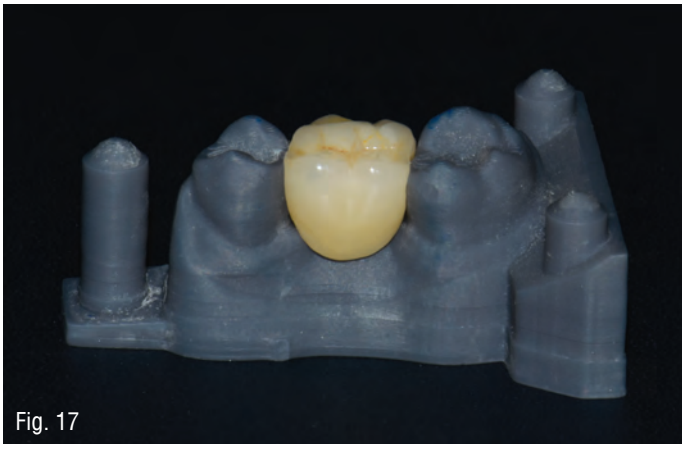
Fig. 17


Fig. 18


Fig. 19


Fig. 20

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The Author

Saurabh Gupta, BDS MDS is graduated from Manipal University, India and holds Master's Degree in Oral & Maxillofacial Surgery from RGUHS, Bangalore, India. He is also trained in multiple allied surgical disciplines including Implantology, Laser and Digital dentistry. Currently, he is working as Clinical Director, Digital Dental Design Clinic & DVG's lab (3M Authorized), Bangalore. He is also a visiting senior consultant at Aarogya Dental and Maxillofacial Center, Delhi.

He lectures nationally and internationally, he is Education Director/ Board Member of International Academy of Ceramic Implantology, which is the first academy in USA dedicated to metal free implantology. He is an active member of ZIRG (Zirconia Implant Research Group), whose objectives are to lead and orient research in metal free implantology and support young and established clinicians in clinical and scientific research. He is also serving the "Bioceramic Division" of "The American Ceramic Society", Ohio, US. He is also involved in Research and Development projects at Indian Institute of Science (IISc), Bangalore. He is also a fellow and ambassador for Cleanimplant foundation, whose mission is to assess production quality and cleanliness of commercially available implant surface. He is also serving as a board member of CBCT magazine. Apart from this, he is also part of MIDI Implantology group based in Spain and clinical specialist for COHO Biotechnology, Taiwan. At present, he is involved in lot of research studies on zirconia implant materials and digital dentistry.

Multiple Adjacent Anterior Tooth Replacement Utilizing One-piece Ceramic Dental Implants.

Dr. Dan Hagi, DDS, FAGD, FICOI, (A)FAAID

Figure 1: Retracted pre-op
Anterior 3 crowns on teeth 11,21 and 22 requiring treatment.

The number of teeth replaced by dental implants has skyrocketed in the last few decades, and implant dentistry has increasingly become a valid treatment option as a result of edentulism for a wide range of patients. The ongoing research and the advances in the field of oral rehabilitation have provided the modern dentist with an increasing array of tools and techniques that aim to replace missing or hopeless teeth in the most conservative and aesthetic way possible, in an optimistic attempt to replace what nature has gifted us with so exceptionally (biomimetics).

Introduction

The use of one piece ceramic implants for the rehabilitation of the partially edentulous patient has been used for the past 2 decades. Publications of success have varies between 85-97.6% in the literature with the most recent meta analysis showing 1-7 year success of 95%.[1] Issues in the partially edentulous mainly have to do with tissue loss, technical complications and angulation. We trust the metal free approach in rehabilitating the partially edentulous and much like the history of implantology one finds a need to stretch the applications of current dogma.

In its origins the protocols of Branemark and the early pioneers was to rehabilitate the dental cripple, the completely edentulous arch, with a hybrid fixed prosthesis retained on 5 titanium implants. The literature prior to the 1980's mainly focused and established the clinical validity of this approach. Once these techniques and protocols were accepted in North America the pioneers started to apply the same principles for tooth replacement in the partially edentulous patients and start to refine new protocols that could be applied to this aesthetically demanding tooth replacement.[6]

As one can see the evolution of ceramic implants is taking the inverse route. We started with and got comfortable with single tooth replacement in the partially edentulous[3,5] and are now applying the principles to treat multiple adjacent missing teeth in the partially edentulous patient with a metal free approach.[2,4]

This case report will highlight the use of sound prosthetic and surgical protocols in the replacement of adjacent anterior teeth utilizing one-piece ceramic implants and monolithic zirconia prosthetics via a fully digital approach.

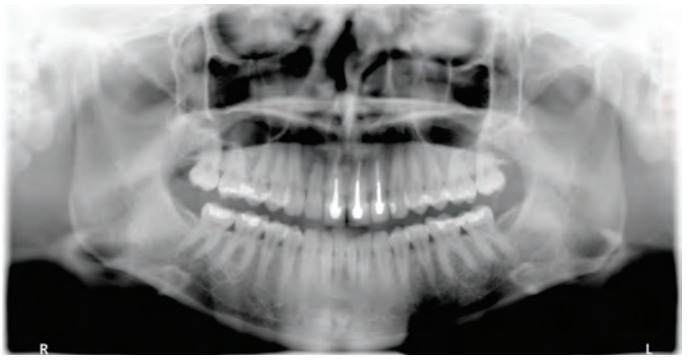

Figure 2: Pre-operative radiograph
Panoramic image showing endodontic treatment on teeth 11,21,22 with metallic posts and full coverage all ceramic crowns.

Figure 3: CeraRoot 21 insertion
CeraRoot 21 all ceramic implant being introduced into the prepared osteotomy. Notice the gingival scallop on the trans mucosal portion of the implant.

Presentation:

Diagnosis

The patient, a 28 year old female with an unremarkable medical history and in excellent general health, presented with a desire to deal with her three anterior teeth she considered very weak and unaesthetic (Figure 1). Radiographic and clinical exams revealed 3 endodontically treated teeth in the maxillary anterior region with metal posts and full coverage restoration (Figure 2). Thick biotype gingiva was very inflamed due to the very deep margins of the crowns. She was experiencing constant bleeding and the loosening and un-cementation of each of the crowns in the last 2 years. Crown on tooth 11 was mobile. Occlusion was stable and she desired the most long standing solution. Her desire was to have a fixed metal free restoration.

Treatment Plan

As the patient wanted a fixed restoration, the options discussed included an option of crown lengthening to obtain a better ferrule, changing the posts to fibre and new crowns and a second option of replacement of the three teeth with implants. After reviewing the risks of the maintenance of the teeth which included potentially retreating the root canals due to long standing coronal leakage, root fracture from removal of posts and weakness of crowns due to limited coronal structure the patient opted to extract and replace the teeth with implants. Long discussion followed dealing with long term prognosis of extracting and replacing the teeth as she was very young. She desired to be completely metal free due to her history of metal sensitivities as well as her personal preferences to have no metals used. We discussed a ceramic implant supported reconstruction. The possibility of the use of a zirconia one piece dental implant (CeraRoot, CeraRoot SL, Granollers, Spain) was discussed and the alternative titanium implant option was also discussed. We also had to address her age. As a 28 year old she would need to maintain her reconstruction for a long period of time. We do not know the long term

Figure 4: Implant position post-surgery
Final implant position at the end of surgery with the buccal margin about 1mm below the buccal tissue level.

Figure 5: Angulation of implants.
The final angulation of the implants seems extreme however in order to engage the palatal bone and emerge in the correct position the implant does lean a little forward. This position is restorable with the use of a monolithic restoration that can be made thinner on the facial surface as there is no need to blockout or mask a dark core.

Figure 6: Post-surgery Provisional
Direct provisional restorations, note the shine through of the white abutments. This will not be visible through the final monolithic zirconia but clearly demonstrated the thinness of the facial prosthesis.

operative area. An atraumatic extraction of the teeth was preformed using surgical elevators and forceps and the sockets thoroughly curetted. The osteotomies were preformed after each extraction utilizing very efficient ceramic drills at a maximum speed of 350RPM, the slow drilling helps maintain the vitality of the bone. The osteotomy was preformed after each extraction to maintain the tooth position and angulation of the implant to mimic the initial angulation of the tooth. No irrigation was used during the drilling and bone debris was collected from the drills. The final preparation of the osteotomies was done with the countersink drills. Careful attention was paid to preparing the implant site to accommodate the wide diameter of the prosthetic emergence. The shoulders of the implants were placed 1mm apical to the desired tissue level. The central incisors were replaced with CeraRoot 21 implants giving a natural gingival scallop and

Figure 7: Healed implants.
After three months of healing and soft tissue maturation we can visualize the final position of the implants and future crown margins.

outlook beyond 10-15 years of any of our approaches, she understood that whatever option she choose revisions would be necessary in the future.

To be able to rehabilitate this patient we needed to be able to place the one-piece implants in such a way that we could account for skeletal angulation (Figure 5). Because we were planning to place the implants immediately following extraction we knew the exact tooth position. Guided by a pre-operative wax up we knew exactly the emergence of each part of the prosthesis. The trans-gingival collar of the CeraRoot implant would provide us with a built-in emergence profile making the final prosthetic protocol simple and functional with very little in terms of prosthetic complications.

The final treatment would involve the extraction the three teeth, immediate placement of three CeraRoot implants on the upper arch and immediate provisionalization with a directly formed bisacryl provisional prosthesis. After a period of 3 months and the rigid fixation of the implants, full contour milled Prettau bridge would be used as final restoration.

Surgical Treatment

The patient was pre-medicated with an antibiotic (Amoxicllin 500mg) which was to be continued for 7 days post operatively. 4% Articaine 1:200,000 epinephrine (Septocaine, Septodont Inc., France) was infiltrated and used to anesthetize the

Figure 8: Healed implants radiograph
Periapical radiograph after 3 months of healing. Proper implant position and healthy spacing between implants allowing for the maintenance of crystal level of bone.

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Figure 9: Smile Designer Pro Design
Post-surgical smile design to confirm ability to deliver the final shape of the prosthetics. This was presented to the patient to confirm outcome. We utilized the Smile Designer Pro app for this visualization.

Figure 10: Occlusal view of the implants
Preparation of the tissues for intraoral scan. Laser was used to remove small amount of excess tissue, emergence of the implants is in line with the teeth.

Figure 11: STL Occlusal view
Occlusal view of the digital model.

the lateral incisor with a CeraRoot 12 implant (Figure 4). The implants were threaded into place and achieved excellent stability at over 30Ncm with the buccal restorative margin placed where desired (Figure 3). The facial of the extraction site, and the circumferential gap between the implant and the bone, was grafted with the autogenous bone chips mixed with allograft (Oragraft, Mineralized bone, LifeNet,VA, USA). The post-surgical intraoral radiograph shows the final position of all 3 implants (Figure 8). A Periotest M (Medizintechnik Gulden, Germany), a wireless device used to provide an

Figure 12: Digital Model STL
CS3600 digital STL output that was the foundation of the digital lab work. Precise digital model used to fabricate the restorations.

Figure 13: Digital Model PLY
The CS3600 outputs a full colour digital file that the laboratory can use along with the black/white STL file to more accurately design the final restoration.


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Figure 14: Day of cementation polarized view.
Final prosthesis day of cementation showing nice tissue integration and slight internal show through of the abutment.

Figure 15: Day of cementation final
Non-polarized light shows nice integration of the prosthesis and no show through from the inside. Soft tissue and papilla maturation will take place over the next 4-6 months.

objective evaluation of an implant's stability, was used to assess a baseline for stability of all 3 implants. The readings for for all implants ranged between -1.5 to +3.3. The absolute range for the Periotest M is -8.0 to +50. The more negative the reading the greater the stability/dampening effect of the measured tooth.

An immediate provisional (VISCO III Auto-cure, Anaxdent, OK, USA) was made with a direct method from a digital wax-up that was prepared previous to surgery and transferred intramurally via a essix appliance (Figure 6). The material was allowed to set on the teeth and shrink-wrap so as to splint the three implants rigidly. Once healed the material would be cut off.

Prosthetic Treatment

After 12 weeks, the soft tissue healed and the implant integrated and we were now ready for final restoration (Figure 7). Once again a Periotest M (Medizintechnik Gulden, Germany) was used to assess the stability of the implants, the readings now ranged from -4.5 to -2.8, each implant showed increase in stability. The provisional was cut off and the implants were scanned with an intraoral scanner (CS3600, Carestream, FR) after tissue retraction (Figure 10). A digital smile design utilizing a smile design software (Smile Designer Pro, TastyTech, Toronto, CA) (Figure 9) was used to communicate final tooth shape with the patient again as she wanted some changes from her post-operative provisional.

The STL and PLY files from the scan were transferred to the laboratory (Figures 11-13). Utilizing the digital files and the library of CeraRoot analogs a three unit splinted Prettau bridge was designed and milled. The lingual of the lower anteriors was made thicker to give more bulk thickness. The bridge was tried in and inserted with a Glass Ionomer cement (GC FujiCEM 2, GC America). Excess cement was carefully cleaned. Occlusion was adjusted again as to avoid any prematurities (Figure 14-15).

Discussion

When treating multiple adjacent missing teeth, the application of the one-piece ceramic implants seem to preform as well as traditional two piece titanium implants. However, the use of the one-piece ceramic implants does carry some technical protocol modifications that need to be highlighted in treating the partially edentulous patients that can avoid clinical complications that in the author's opinion have been ignored for some time. Implant angulation of the one-piece design is a primary concern. Surgical placement of the implant needs to be precise while respecting the envelope of bone support. The visualization of the final prosthetic outcome is required in order to make sure that the implant is placed in optimal position, or digital guidance may be used to accurately guide the placement. This is achievable with the one piece implant but needs to be managed by meticulous surgical planning and execution.

The complexity of creating and maintaining tissue contours and health around the implant abutment complex is an ever elusive aspect of modern implantology. With the emergence profile being designed as part of a white, tissue level implant we see less peri-implant disease and less mechanical and aesthetic soft tissue complications. The absence of a micro gap assures better bone preservation and thus better soft tissue outcomes. Periodontal health is also amplified by the absence of a connection and micro-gap, and the affinity of the gingival complex to the zirconium oxide surface.

This case presented an example of where the tooth replacement concept can be simply and cost effectively applied to rehabilitating multiple adjacent anterior teeth with great aesthetic and functional success.

As with any aspect of this emerging field we need more evidence and more work to validate the application of these techniques in the long term. ■

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The Author

Dr. Dan Hagi, received his dental training at the University of Toronto and now maintains a multidisciplinary implant and rehabilitative practice in Thornhill, Ontario. He is an associate Fellow of the American Academy of Implant Dentistry(AAID), a Fellow of the International Congress of Oral Implantology(ICOI), the Academy of General Dentistry (AGD), the Academy for Dental Facial Esthetics (ADFE) and the Misch International Implant Institute(MIII). His private practice focuses on metal free, minimally invasive implant rehabilitation and aesthetic smile design. He is a lecturer and mentor at the Dental Implantology Center of Excellence (DICE) which was founded to bring dental implant education to all, as well as a consultant on emerging metal-free materials and techniques.

Full Mouth Reconstruction Ceramic Implants

Dr. Yuri May

When patients present with terminal dentition there are several options to transition a patient to a removable prothesis or an implant supported fixed prothesis. Across a certain cross section of demographics, which tends to reflect either those of higher socioeconomic means or with higher degree of education, there is a strong patient preference for implant supported fixed prosthetics as opposed to removable PMMA dentures. While the benefits of implant supported prosthetics are numerous, the largest benefit is the stability that the implants provide which drastically improve masticatory function, while also avoiding palatal coverage typical of maxillary removable prosthetics. Overall, implant supported prosthetic will prevent long term bone atrophy in the jaws which is generally seen in patients wearing a denture for a long period of time. Lastly, but most importantly, patients often attribute the choice of fixed prosthetics over a denture due the improved quality of life, enhanced sense of confidence much improved esthetics of non-PMMA based implant supported prosthetics.

Titanium dental implants have been the standard of care in dental implantology for the last half century, and as such, titanium alloy implants also have served as the foundation for full arch implant supported restorations. The most common complication associated with dental implants are peri-implant mucositis and peri-implantitis. Peri-implant mucositis differs from its more advanced diagnosis of peri-implantitis in that the inflammatory disease of the soft tissues surrounding the dental implant show no signs of marginal bone loss, unlike peri-implantitis which is the observation of both soft tissue inflammation and bone loss around the implant. Peri-implant mucositis is considered to be a precursor for peri-implantitis.[3, 4] Over the last several years, more and more research has begun to show that peri-mucosistis, is correlated to titanium alloy degradation and the cytotoxic effects of the metal particles in the local tissues.[5]

These findings, appearing in multiple studies and continues to push dental implantology practitioners to explore other, non-metal implant options initiating the growth in the field of zirconia dental implants.

In recent years ceramic implants are emerging as an alternative option to titanium implants. Zirconia implants, also synonymously referred to as ceramic dental implants

Figure 1: Pre-operative radiograph

Figure 2: Pre-operative clinical situation showing Peri-Mucositis around implants in the area of 19 and 20

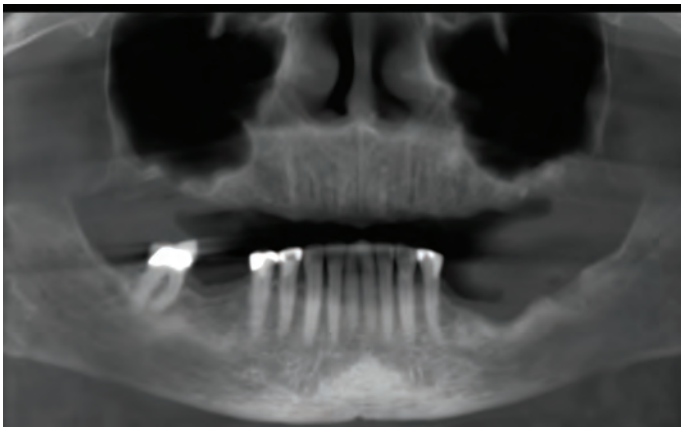

Figure 3: Radiograph taken for implant planning

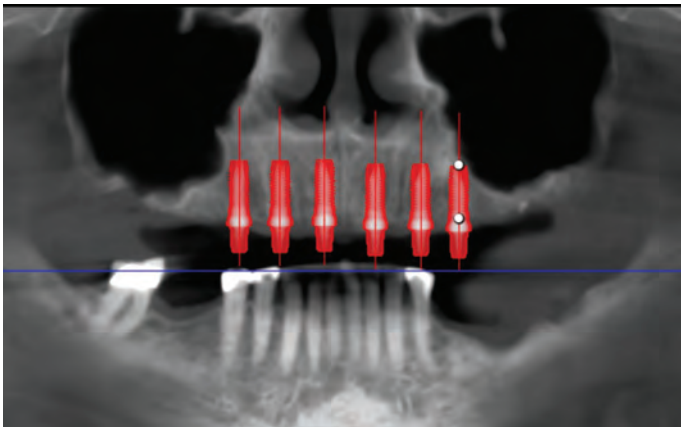

Figure 4: Radiograph demonstrating proposed surgical plan placement of Z-systems Z5M Dental implants

Figure 5: Fast Guide implant system used for placing parallel implants

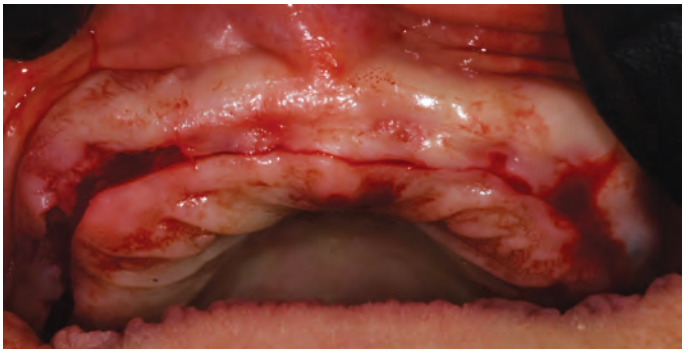

Figure 6: Surgery for implant placement demonstrating initial incision

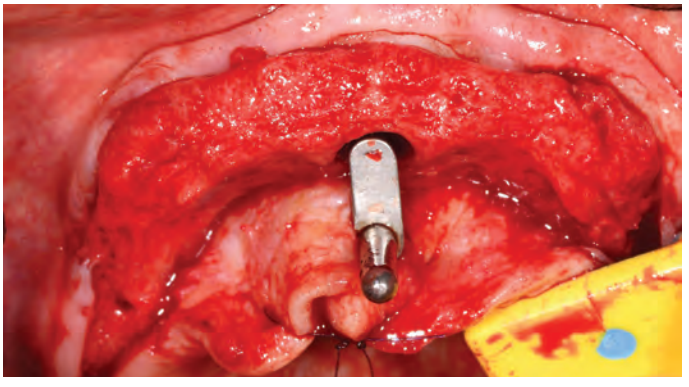

Figure 7: Multi-Chanel device adopted to the Nasopalatine Canal

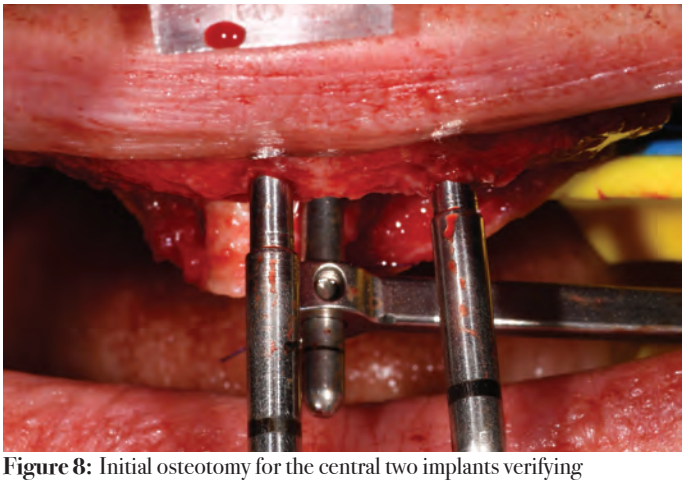

Figure 8: Initial osteotomy for the central two implants verifying parallelism to the multi chanel device

are classified as metal-free dental implants and tend to be comprised of mostly zirconia oxide (ZrO_2) 95% and typically include less than 5% of combinations of ytria oxide (Y_2O_3) and alumina oxide (Al_2O_3). The zirconia dental implants have demonstrated superior soft tissue response and integration compared to titanium implants. Improved soft tissue architecture occurs due to an increase in collagen organization in the connective tissue zone around zirconia implants as compared to titanium alloy dental implants which leads to less ingress of the bacteria and reduced inflammatory infiltration compared to titanium implants. [2,6]

A recent 2018 meta-analysis investigating the degeneration of titanium implants in soft tissue, consisting of 79 published studies through 2016, found titanium implant degradation led to increased bacterial infiltration which contributed to prevalence of peri-implantitis around titanium implants. The results showed that pro-inflammatory cytokines, infiltration of inflammatory response cells and activation of the osteoclasts activity are stimulated in peri-implant tissues in the presence of metal particles and ions. Moreover, degenerative changes were reported in macrophages and neutrophils that phagocytosed titanium microparticles, and mutations occurred in human cells cultured in medium containing titanium-based nanoparticles. Debris released from the degradation of dental implants has cytotoxic and genotoxic potential for peri-implant tissues. Thus, the amount and physicochemical properties of the degradation products determine the magnitude of the detrimental effect on peri-implant tissues. [1]

Unlike titanium implants which have multiple restorative abutment of options for difficult to restore or surgically challenging cases, zirconia dental implants have limited restorative options. Multi unit abutments, custom abutments and non-engaging screw retained abutments which are often used in full arch fixed prosthetic restorations are not available for zirconia implants. The particular case described in this article was completed with one piece mono block ceramic implants, wherein the design of the implant has the implant and abutment connected. The following case reports illustrates a maxillary dental reconstruction that used zirconia implants to achieve predicable and clinically optimal result. Detailed planning and parallel placement of ceramic implants is critical as abutment angulation modification is limited as compared with titanium implants.

Case Report: Ceramic Implant Supported Full Arch Fixed Zirconia Prosthetic

Diagnosis

A 65 year old female patient approached our office with a predetermined objective of receiving metal-free implants and the removal of the peri-implantitis affected dental implants. Patient also had a need for a high degree of esthetics as she was involved in recreational dancing competitions and training. The patient presented with a history of unilateral

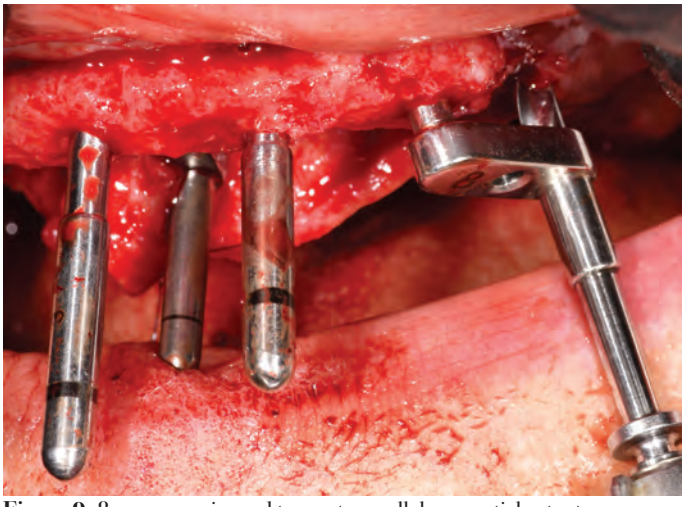

Figure 9: 8mm spacer is used to create parallel sequential osteotomy

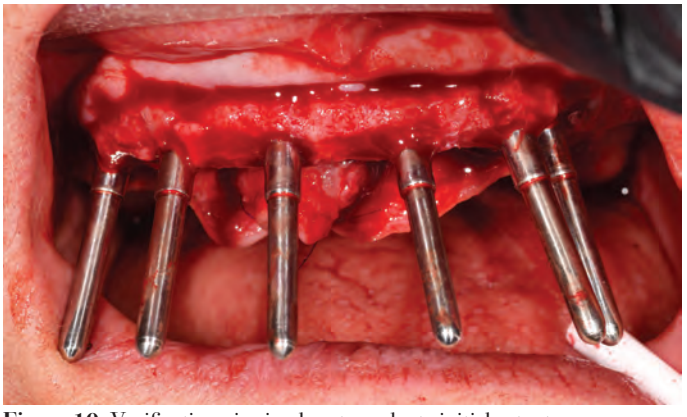

Figure 10: Verification pins in place to evaluate initial osteotomy preparation

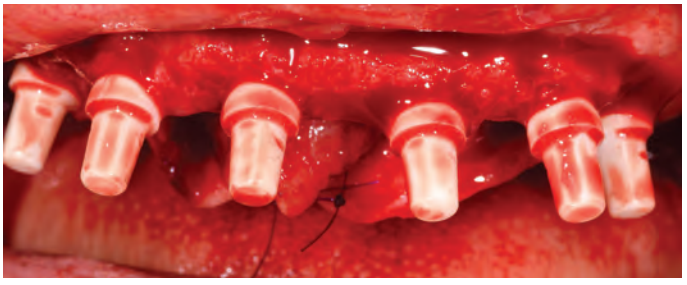

Figure 11: Implant placement front view

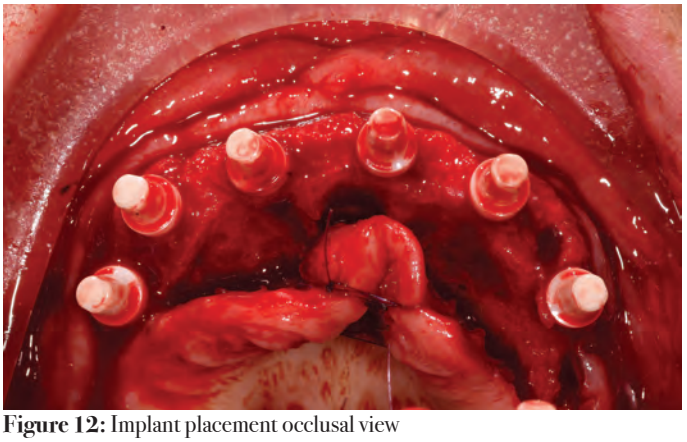

Figure 12: Implant placement occlusal view

breast cancer diagnosis that had been stable for 2 years. The patient was a non smoker and presented with terminal maxillary dentition due to multiple missing teeth, fractured restorations, decay, peri-apical abscess around tooth #8 and non-vital teeth #6 and #12 as well as peri-implantitis around implants in the site of #19, #20. The probing depth around titanium implants #19 and #20 ranged from 6-10mm in addition there was secondary decay on tooth #17 extending sub-gingivally.

Treatment Plan

Due to the history of peri-implantitis and failing titanium dental implants, the patient requested replacement of missing teeth with metal free ceramic dental implants. Treatment options for maxillary reconstruction were discussed that included:

1. Saving remaining teeth, performing root canal treatment on the non-vital teeth, replacing defective restorations performing bilateral sinus lift grafting to accommodate implant placement in the posterior maxillary region

2. Removal of remaining maxillary dentition, placement of six zirconia one piece implants

(Proposed Brand: Z-Systems, Switzerland) from second molar to second pre molar to avoid sinus lifting procedure and a fixed implant supported zirconia full arch bridge.

Patient had confidently chosen the second option for full arch reconstruction with implants and a zirconia fixed implant supported prosthetic. Further discussions were carried out to determine whether to complete the case with immediate or delayed implant placement. The patient chose to have delayed placement due to the implications of her oncological diagnoses and preference for less traumatic surgery.

Treatment of the mandible included options for a full lower arch reconstruction with zirconia implants and implant supported prosthetic or removal of the peri-implantitis involved titanium implants and a removable partial denture. Due to the financial burden, the patient elected to remove the failing titanium implants #19 and #20, and tooth #17 and to replace the missing teeth with a lower partial denture. Discussions took place educating the patient that lower implants could be placed in the future if the lower partial was a not a suitable or comfortable option long term.

Surgical Treatment

All maxillary teeth and #17 were atraumatically extracted with a periotome and forceps, and no flap was raised. Extraction sockets were irrigated and curetted A-PRF membranes were used in the extraction sockets to speed up the healing process. Implants #19,20 were removed atraumatically with (Megagen) 911 fixture removal kit by using reverse torque technique to

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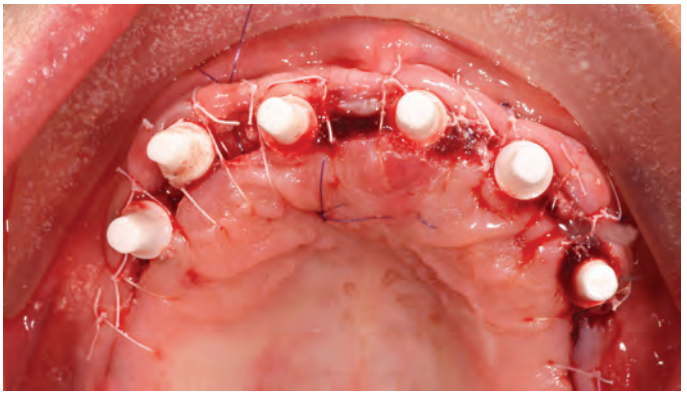

Figure 13: Flap repositioned ready for temporary fabrication

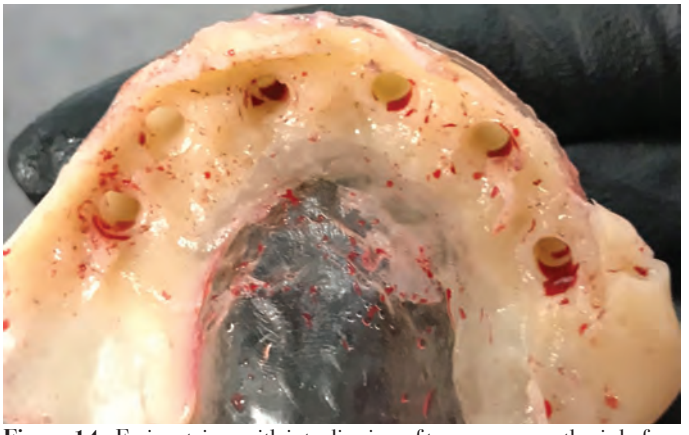

Figure 14: Essix retainer with intaglio view of temporary prosthesis before removal of extra material

Figure 15: Temporary restorations cemented in place retracted view

Figure 16: Temporary restoration full smile

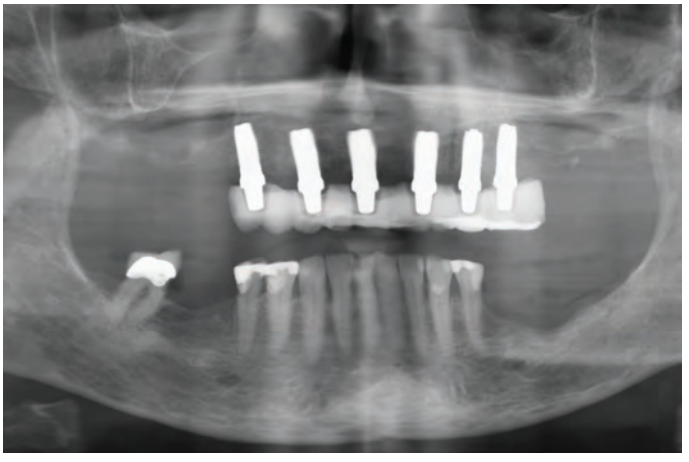

Figure 17: X-ray to verify implant placement position

Figure 18: 4 month post surgery temporary restoration removed demon strating healthy matured gingiva around integrated implants

take out the implants. Due to severe bone loss around the implants no trephine was required to remove the implants. Bone grafting material was placed in the area of #19,20 in case patient wanted future implants in that area. Immediate maxillary denture was delivered at the day of the surgery.

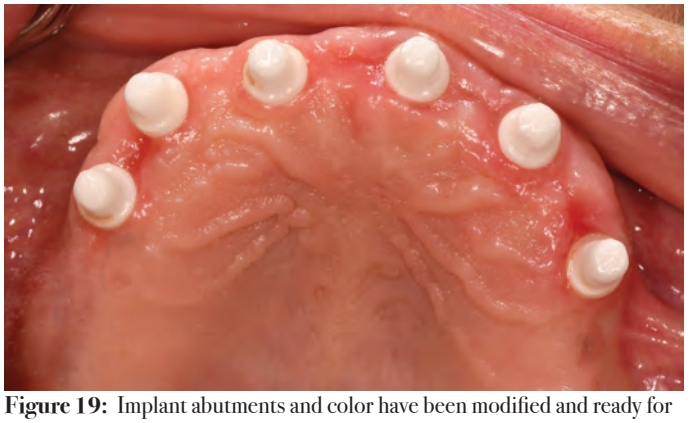

Figure 19: Implant abutments and color have been modified and ready for final impression

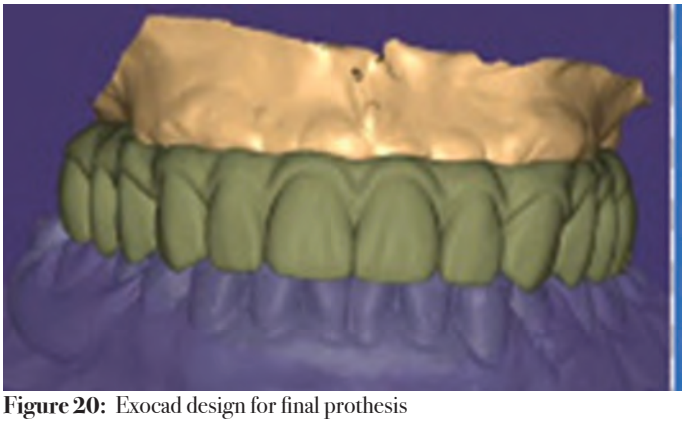

Figure 20: Exocad design for final prothesis

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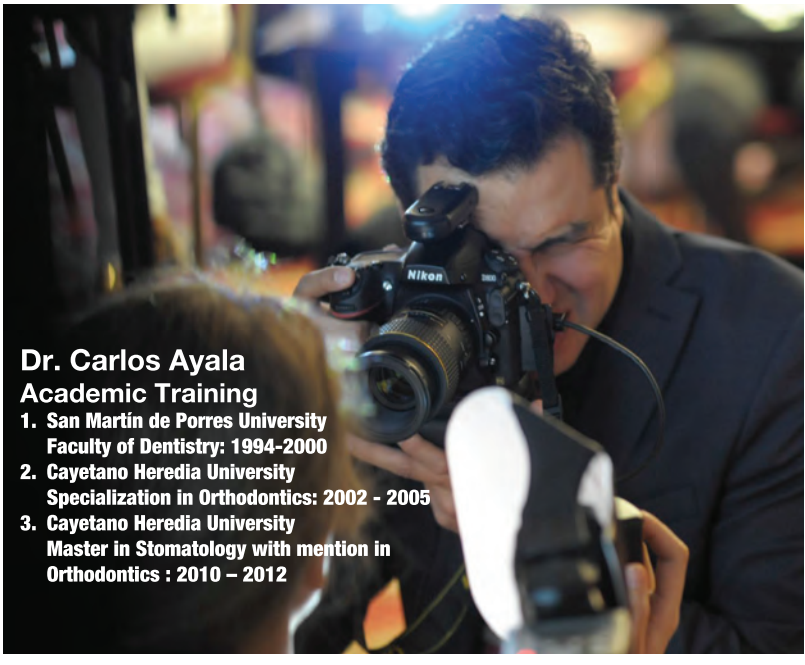
- •Management of macro-flashes and light modifiers.
- •Shade communication between clinic and laboratory.
- •Capture of the microtexture and optical effects.
- •Dental photography from life-size 1: 1 (1x) to 3:1 (3x).

Part IV. PHOTOGRAPHY FOR THE LABORATORY: SETUP FOR SLR CAMERAS & SMARTPHONES
- •Micro-photography with focus-stacking Cross polarization Digital image management
- •Macro-photography in the dental laboratory: capture of ceramic and metal small elements.
- •Birefringence of enamel: Light and filters



Dr. Carlos Ayala

Academic Training

1. **San Martin de Porres University Faculty of Dentistry: 1994-2000**
2. **Cayetano Heredia University Specialization in Orthodontics: 2002 - 2005**
3. **Cayetano Heredia University Master in Stomatology with mention in Orthodontics : 2010 – 2012**

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Figure 21: 3D printed model used for mounting of the final prothesis

Figure 22: Final Zirconia Birdge with porcelain facial overlay and Pink porcelain for ginigva

Figure 23: Final Prothesis Demonstrating excellent esthetics

Figure 24: Intraoral view after cementation

After three month healing period a new CBCT was taken to evaluate bone healing and plan implant placement. Sufficient bone was present in the maxillary anterior region to place six Z-Systems Z5M 4x10mm implants. To ensure that the implants are placed parallel Fast Implant Guide Designed by Dr. A. Simonpieri was used.

A full thickness mucoperiosteal flap was raised to expose the surgical area. The palatal flap was extended to visualize the nasapalatine canal foramen. Fast Implant Guide was used in preparation of osteotomy sites for the implants the osteotomy was performed at 800 rpm with copious irrigation to prevent overheating of the bone. Careful attention was paid in preparation of osteotomy sites to achieve parallelism between all the implants and proper placement of the most distal implants to avoid the maxillary sinus perforation. Guide pins were used to confirm osteotomy parallelism. Primary stability on all implants was achieved and implants were inserted at 35Ncm. Primary stability is crucial with one-piece ceramic implants because all implants need to be immediately loaded. The flap tissue was sutured together around the collar of the implants using Glycolon 4.0 sutures for vertical mattress sutures and PTFE 4.0 as interrupted sutures.

Temporarization

A clear essix retainer with palatal coverage was fabricated ahead of time to be used as a matrix for the fabrication of a temporary prosthesis. Structure 3 Temporary Crown & Bridge Material (Voco) was loaded in the matrix and the palatal seat was used to position the stent in the proper location. Excess material was removed, occlusion was adjusted and the temporary prosthesis was cemented with Bifix temporary cement (voco) minimal amount of the cement was used to prevent cement entering the surgical site. Splinting the implants together is of vital importance during the post surgical healing phase to ensure implant protection and stabilization while maximizing osteointegration potential through the healing phase. Patient was instructed to maintain a soft food diet during the healing period for 3 months.

Final Restoration

Four months after implant placement, the temporary restoration was removed. Implant integration was tested by using implant placement driver with a torque wrench to verify impalnts are stable at 35Ncm. Healthy soft tissue maturation was visible around the implants. Soft tissue overgrew at the mesial portion of the implant collar at the site of #6; that tissue was removed using Solea CO2 laser. One of the benefits of using the Z-Systems one-piece implant is the ability to customize the collar and the abutment of the implant by using Fine Diamond Bur at 200,000rpm with copious irrigation. The abutment heights were reduced to improve the path of draw for the final prosthesis and abutments angulation were adjusted to achieve ideal parallelism between all of the implants. The collar heights of the implants were reduced to be at the level of the soft tissue (see photo). Digital scan utilizing Trios (3-Shape) was taken of upper and lower arches and upper temporary prothesis. (To be used as a guide for designing permanent restoration). The final prosthesis

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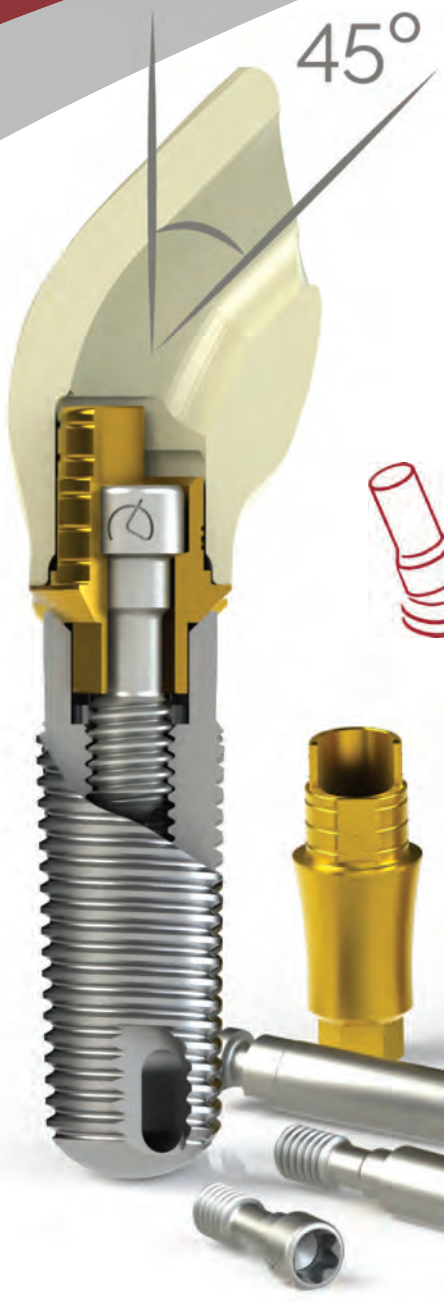

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Figure 25: Occlusal view after cementation

Figure 26: Extraoral view demonstrating excellent clinical outcome

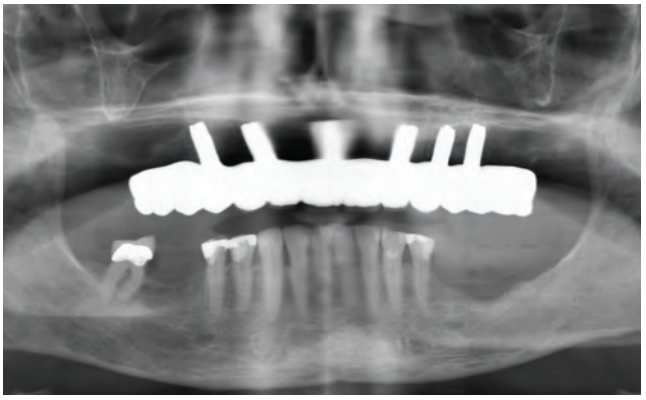

Figure 27: Final radiograph verifying proper placement of the final restoration

Figure 28: Z-systems implant system with macro-view of selected implant

was designed in excocad by Joe Abad Santsos, and fabricated by Gala Dental Arts (West Hartford, CT). The prothesis is made out of zirconia with facial and gingival porcelain cutback. The prothesis was cemented with the dual cure resin cement Rely-x Unicem 2 (3M). To prevent excess cement during cementation after loading the prosthesis with cement the prosthesis is placed on a 3D printed model to remove extra cement and obtain a thin uniform layer over the abutments that will not extrude onto the soft tissue.

Discussion

There are many restorative options available to implant patients today. Deciding which method to use in each case depends on clinical and patient demands. The treatment plan for this case proved to be successful because it achieved the patient goal of having an implant supported non removable prosthesis on ceramic metal-free implants with healthy soft tissue integration. The main drawbacks of treatment with one-piece ceramic implants is the need to place the implants perfectly parallel to achieve a path of draw for cemented prostheses. Additionally, the inability to place tilted implants in the posterior maxilla with angled multi-unit abutments creates a large distal cantilever in the final prothesis unless a sinus lift procedure is performed and implants are placed in the first molar region. In the hands of a skilled and experienced zirconia dental implant practitioner, much is possible with zirconia dental implants but often requires a higher degree of planning and more precise implant positioning to achieve the desired outcome. ■

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The Author

Dr. Yuri May received his dental degree from University of Connecticut School of Dental Medicine and completed GPR residency at Bronx Lebanon Hospital in New York City. After working in private practice for a number of years, Dr. May started his own practice focusing on full mouth reconstruction, oral implantology and metal free dentistry using the latest digital dentistry techniques and technology. Located in Connecticut, Dr. May has established a leading zirconia implant practice in the Northeast USA focusing on specialized full mouth metal-free reconstruction cases. He is an accredited member of the International Academy of Oral Medicine and Toxicology, a Founding Board member of the American Academy of Ceramic Implantology, a member of the International Academy of Ceramic Implantology

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Maintaining An Adequate Band Of Keratinized Gingiva Around A Two–Piece Zirconia Posterior Implant

A Clinical Case Report by Marjorie Baptiste, New York

Introduction

There has been a huge controversy in the literature in regards to the importance of an adequate band of keratinized gingiva around titanium implant supported restorations. Some studies show little or no difference in the success of titanium implants placed in the oral mucosa zone or keratinized gingival zone. Other studies show that an important band of keratinized gingiva is needed to maintain adequate plaque control as frequent accumulation of plaque can lead to soft tissue inflammation and later peri-implantitis.[4] A retrospective clinical study shows higher plaque accumulation and soft tissue inflammation in the absence of keratinized mucosa or attached mucosa more particularly in posterior titanium implants irrespective of their surface configurations.[3] Zirconia implants as an alternative option seemed to present some clinical advantages compared to titanium implants in regards to a better peri-implant soft tissue healing. Zirconia implants show less plaque accumulation than titanium implants in peri-implant tissues according to a microbiological study looking at the presence of cocci and the absence of long rods on $Zr0_2$ implant surfaces.[2] However, increasing the band of keratinized gingiva may still be crucial to maintain peri-implant health around ceramic implants in the posterior region. This case report will demonstrate the stability and health of the peri-implant tissue around a two piece tissue level zirconia posterior implant via the palatal-crestal technique incision.

Clinical Report

A 52 year old female Caucasian patient with unknown medical conditions presented to my office in June 2016. The initial diagnosis revealed that #4 was unrestorable and fractured (Fig 1). #4 was considered hopeless. Therefore, #4 was atraumatically extracted with periotomes. The site was degranulated and then irrigated with a mixed of sterile water and hydrogen peroxide. The site was grafted using autogenous bone particles and a synthetic bone graft (Cerasorb 500-1000um, Curasan). Blood was obtained from the patient and centrifuged to collect an a-PRF membrane. 4 months were allowed to heal before the placement of the two-piece zirconia implant (Fig 2). An incision made palatal-crestally was performed with a full thickness mucoperiosteal elevation. Mesial and distal vertical incisions to #4 were made (Fig 3). Z5c Zirkolith, a self-tapping tissue level two-piece cemented Zirconia implant from Z-system (4X 10mm) was placed in an ideal location with an adequate angulation (Fig 4). A periapical x-ray shows the angulation (Fig 5).Restorative treatment options were presented to the patient and patient chose cement retained implant crown. Implant was torqued at 35Ncm and a healing cap made of PEEK was placed to cover the implant (Fig 6). No primary closure was obtained in order to maintain the band of keratinized gingiva on the facial of #4. 5.0 Chromic gut sutures were used to close the vertical incisions and interrupted sutures were used to close the edentulous ridge mesial and distal to the healing cap. The implant was allowed to osseointegrate for 6 months. No second stage surgery was necessary as the healing cap was showing on top of the tissue. A stable band of keratinized gingiva tissue of more than 2mm was noticeable with healthy and mature peri-implant mucosal tissue (Fig 7). Within a week a straight abutment was cemented then a ceramic crown was placed by the restorative dentist(Figs 8-9). A radiograph was taken right after placement of the ceramic crown and another radiograph within a year (Fig 10-11). Within a year follow up, a healthy band of keratinized gingiva was noticeable on the facial of the two-piece Zirconia implant crown and patient was satisfied with the result.

Figure 1: Unrestorable and fractured # 4

Figure 2: 4 months healing following Extraction of # 4 and ridge preservation using autogenous bone particles with synthetic bone graft and A-PRF membrane

Figure 3: Palatal-crestal incision with mesial and distal vertical incisions

Figure 4: Angulation

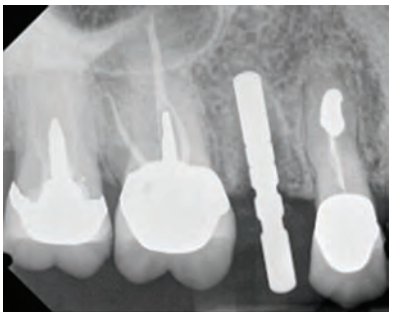

Figure 5: x-ray showing the angulation

Figure 6: A healing cap made of PEEK was placed

Figure 7: 6 months healing of osseointegration

Figure 8: Abutment cemented

Figure 9: Ceramic crown on #4 was placed

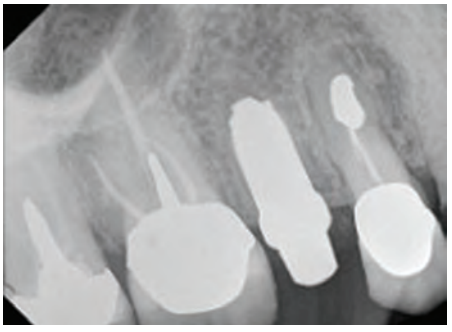

Figure 10: Radiograph with cemented abutment

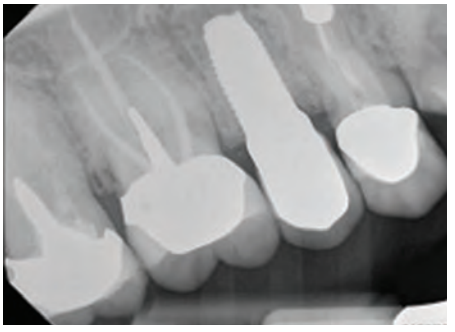

Figure 11: Radiograph with final crown cemented to the two- piece tissue level Zirconia implant

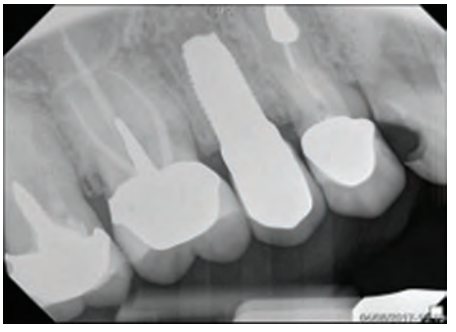

Figure 12: Radiograph in one year showing stability of the bone around the two-piece Zirconia Tissue Level implant

Conclusion

The Z5c two-piece zirconia implant from Z-Systems showed excellent clinical result. The soft tissue attachment looks healthy and mature around the two-piece zirconia tissue level posterior implant. The soft tissue response showed no clinical sign of inflammation in one year follow-up. The ability to maintain a great band of keratinized gingiva was crucial around a two-piece zirconia implant where a buccal concavity is very common around premolars. In conclusion, the thick zone of keratinized gingiva around a zirconia implant created a prosthetic friendly environment and allowed for simplified oral hygiene maintenance around the zirconia implant. ■

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The Author

Dr. Baptiste has earned her Doctor of Dental Medicine degree (D.M.D) at Tufts University in Boston. During her studies, she was honored with receiving the Northeastern Society of Periodontists Award for Excellence in Undergraduate Periodontics, the Colgate Palmolive Scholarship, and the Dean's Grant. In 2011, she completed her three-year specialty training in Periodontology at Tufts which allowed her to expand her career in implants and gum surgery. Since then, Dr. Baptiste became a leader in performing complex cases in these two areas. She has served as a guest lecturer at the Yankee Dental Convention in Boston and was selected as the guest speaker for the Boston Periodontics Residents meeting held at Harvard School of Dental Medicine. She introduced her innovative research on periodontal plastic surgery in the lingual aspect of the mandibular anterior dentition. She was the Director of the Advanced Program in Periodontics at Lutheran Medical Center in New York from 2013-2015.

Two-Piece Zirconia Implant Supported Rehabilitation in Aesthetic Area

André Chen, Oral Surgery Specialist

Introduction

Traditional implant supported restorations use titanium as biomaterial, the use of metal-free ceramic implants such as zirconia have the potential to improve the esthetics of implant restorations as its color is white, similar to the color of a natural tooth. They have a well-documented biocompatibility and proven stability as a biomaterial for clinical implantation. Furthermore, several animal studies showed that osseointegration and soft tissue development is similar to titanium implants. [1]

Figure 1: Initial Situation. Partial Removable Prosthesis for #22

In the past, zirconia implants were mainly designed as one-piece implants, but compromised implant positions require angulated abutments, which cannot be realized in one-piece implants, for obvious reasons.[2] Hence, there is a clinical demand for two-piece zirconia implants. Recently published data on two-piece zirconia implants showed no significant difference in the success rates when compared to two-piece titanium implants.

The excellent response of soft tissues [3], together with the same osseointegration properties, expressed mainly in BIC (bone to implant contact) as titanium implants, makes this fast-growing technology one of the most promising improvements for manufacturing of dental implants. [4]

Along with the improvement of biology, the pathological aspect also seems to be different, since one of the most outstanding problems in implantology, bacteria, has been proven to have less adhesion than in titanium implants, which may favor stability in the long term, in a disease-free state. [5,6]

In the biomechanical performance, the two-piece ZR has passed all the different tests, especially the resistance to fatigue. [7,8]

It is objective of this case report to introduce a two-piece 2nd generation zirconia implant, placed in a healed ridge.

Case Presentation

Treatment Plan

Female thirty-four-year-old with absence of the upper left lateral incisor #22, having been extracted more than two years prior. (Fig. 1)

The patient currently uses a partial removable device for #22 replacement. After all treatment options were discussed with the patient, an implant supported rehabilitation was proposed and accepted. Medical History was cleared for this ASA1 Patient.

Surgical Treatment

Case was planned with intra-oral scanner (TRIOS, 3Shape, Copenhagen, Denmark) and sent to Implant Studio (3Shape, Copenhagen, Denmark) for combination of the Dicom file with the CBCT information of the patient.

Surgical guide was then 3D printed (Formlabs2®). (Fig. 2,3)

The area where the needle was going to be inserted was treated by means of topical anaesthesia lidocaine hydrochloride 2% (Laboratories Ltd. Volta Santiago, Spain), followed by a period of waiting of two minutes (recommended

Figure 2: Surgical Guide Fabrication (3Shape Implant studio®) (Formlabs 2®)

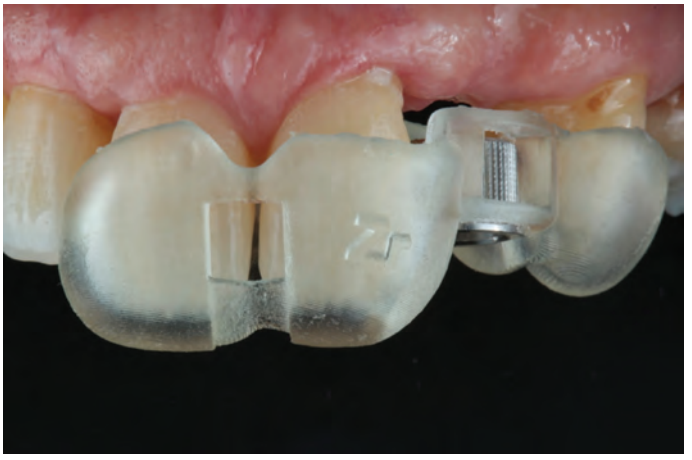


Figure 3: Surgical Guide try-in for Guided Surgery

Figure 4: Guided Osteotomy preparation

Figure 5: Zirconia Two-Piece Implant Placement

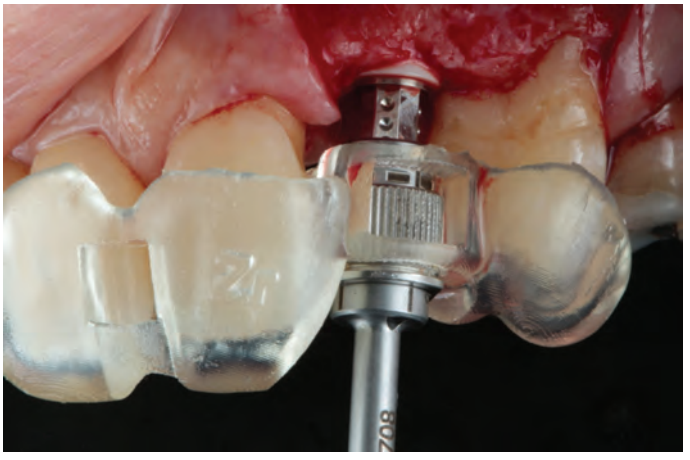


Figure 6: 2 Piece Zirconia Implant fully-seated in the digital prepared osteotomies

by manufacturer) before giving the injection. Articaine cloridrate 4% and epinephrine 1:100.000 (Laboratórios Inibsa, Barcelona/Espanha) was administered by means subperiosteally in the buccal and palatal area. The latency time was 130 seconds before commencing any surgical procedure.

Mid-crestal incision was undertaken with scalpel blade 15c, opening up a full-thickness mucoperiosteal flap with periosteum retractors for access to the basal bone.

The osteotomy was performed according to the manufacturers protocol for guided digital implantology (Straumann Basel®). (Fig. 4)

A two-piece 4.1 zirconia implant (Straumann Pure-Ceramic), Switzerland Basel) with a screw retained abutment connection (Institute Straumann AG, Basel, Switzerland), was placed in a fully digital workflow 1mm supracrestally (according to manufacturer recommendations) with 50 n/cm^2 torque, and closed with a titanium cover-screw. (Fig. 5,6,7)

The Straumann® PURE Ceramic Implants are made of 100% yttria-stabilized zirconia and feature the ZLA surface.

The area was further regenerated with xenografts material (Geistlich Bio-Oss® 0,5 cc) small particles and covered with a resorbable membrane (Geistlich Bio-Gide®). (Fig. 8,9)

Monofilament coated length 40 mm Coated Gore-Tex (Sweden and Martina®, Italy) was used to suture. It is

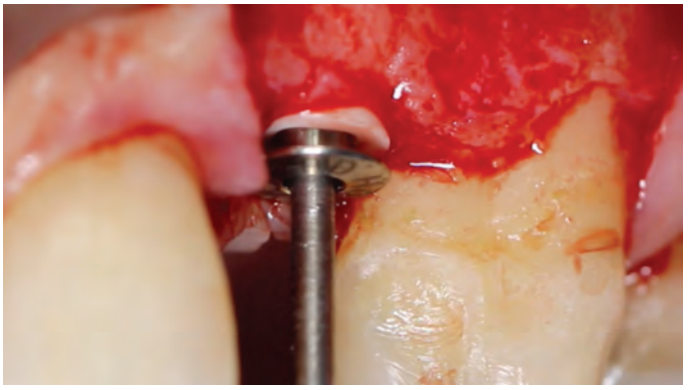


Figure 7: Placement of a cover screw for submerged implant

Figure 8: Guided Bone Regeneration with xenograft material

Figure 9: Guided Bone Regeneration placement of a resorbable membrane

Figure 11: Final Rehabilitation

a sterile non-resorbable synthetic material comprising a polytetrafluorethyene copolymer. (Fig.10)

Sutures were removed 8 days after surgery. The patient underwent a strict oral hygiene protocol: two weeks before implant surgery and 1 week after final rehabilitation.

Two grams of Amoxicillin (Cipamox 1000 g, Atral Laboratories SA Santarem / Portugal) were administered orally one hour before. An analgesic was prescribed (1 g paracetamol - Ben-u-ron 1000g (bene-Arzneimittel GmbH, Munich / Germany)) for use as needed postoperatively.

Patient was instructed to use mouthwash with chlorhexidine 0.2% (Corsodyl, GlaxoSmithKline) 3 days before, 2 times daily for one minute and for 3 more days after surgery.

Prosthetic Treatment

After a healing period of two-month, final rehabilitation was done with a zirconia-ceramic crown. (Fig.11,12,13)

The final prosthodontic procedure included Final impression - Intermaxillary record - Colour Registration - Final crown.

The intra-oral impression was made with an intra-oral-scanner (TRIOS, 3Shape, Copenhagen, Denmark) and printed models (formlabs2®) were made from there.

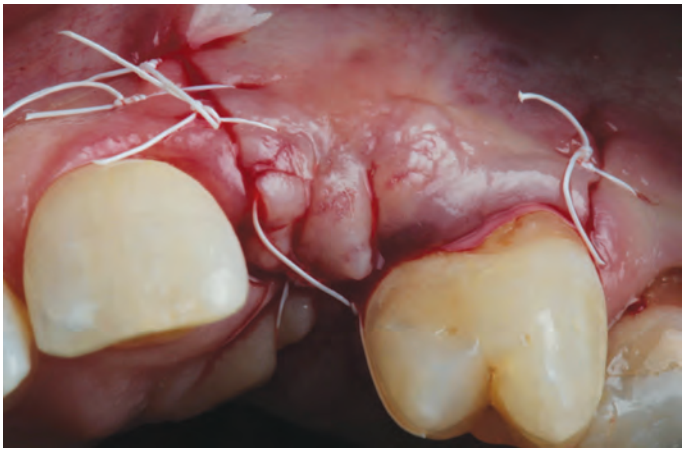


Figure 10: Gore-Tex suture for primary wound closure

The framework was made with Zirconia (Zirkonzhan®) and feldspathic veneered by the lab technician.

The Zirconia crown was then cemented with Glass Ionomer cement (GC FujiCEM 2, GC America) to the titanium interface (Straumann Variobase ®) and torqued down to 35 n/cm^2 according to manufacturer recommendation.

A parallel periapical standardized radiograph was set to measure bone position in relation to the implant platform at exactly the position intended at implant placement and at crown placement. (Fig. 13)

Figure 12: Close up on the Final Rehabilitation

Discussion

Two-piece implants offer nowadays clinical solutions for implant supported rehabilitations. The Zirconia implant is a credible option after all the years of clinical and in vitro research. Clinically, the high primary stability, the integration with digital protocols and the soft tissue response, are key features for this implant therapy.

Traditionally the monotype zirconia implant has some extraordinary biological features (absence of a microgap, incorporation of a zr abutment) but was limited to few clinical indications, the need for bone regeneration correction of horizontal and vertical defects as well as soft tissue deficiencies demanded a different product/implant.

The introduction of a two-piece zirconia implant came to fulfill the clinic portfolio and nowadays zirconia based implantology can be used in the majority of clinical situations.

The combination of a two-piece implant with zirconia has a strong and favorable soft tissue and bone response, that ultimately can lead to few implant biological complications.

The radiograph after crown placement shows a normal biological width formation of about 1,5 to 2 mm.

This case presented an example of where the tooth replacement concept can be simple with great aesthetic and functional success. ■

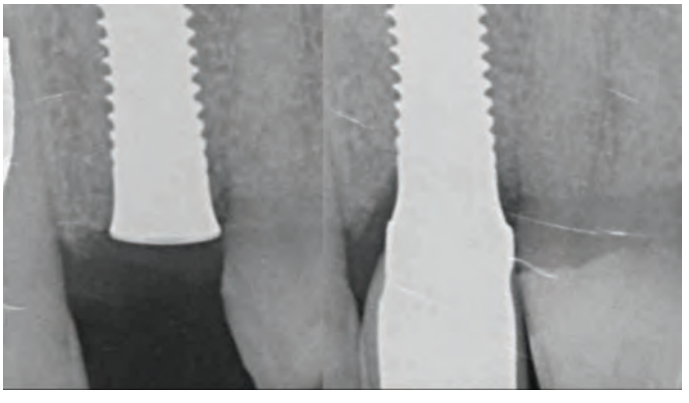
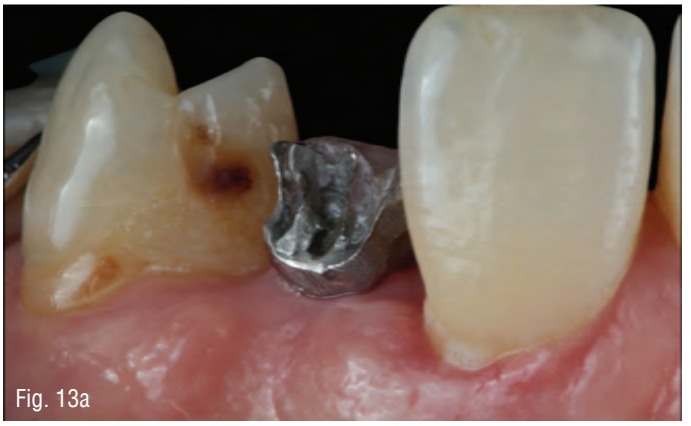
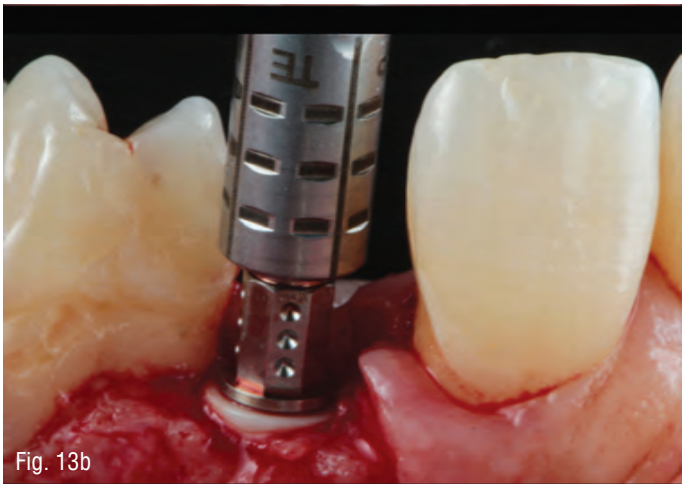
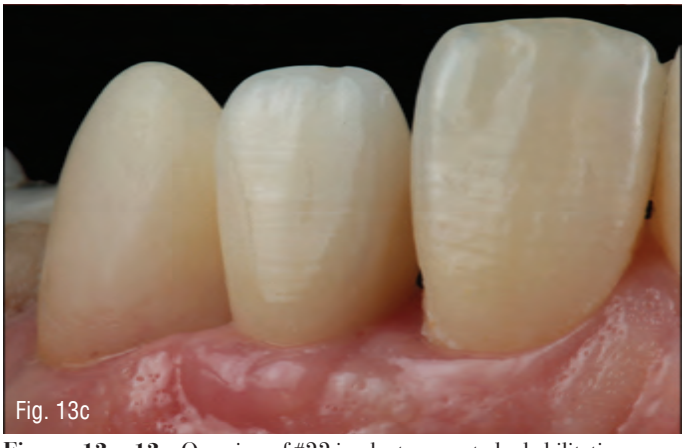


Figure 14: Radiograph immediately after implant installation (left) and with final rehabilitation (right)







Figures 13a - 13c: Overview of #22 implant supported rehabilitation

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The Author

André Chen

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- Oral Surgery Post-Graduation Specialty (Lisbon University College of Dentistry),
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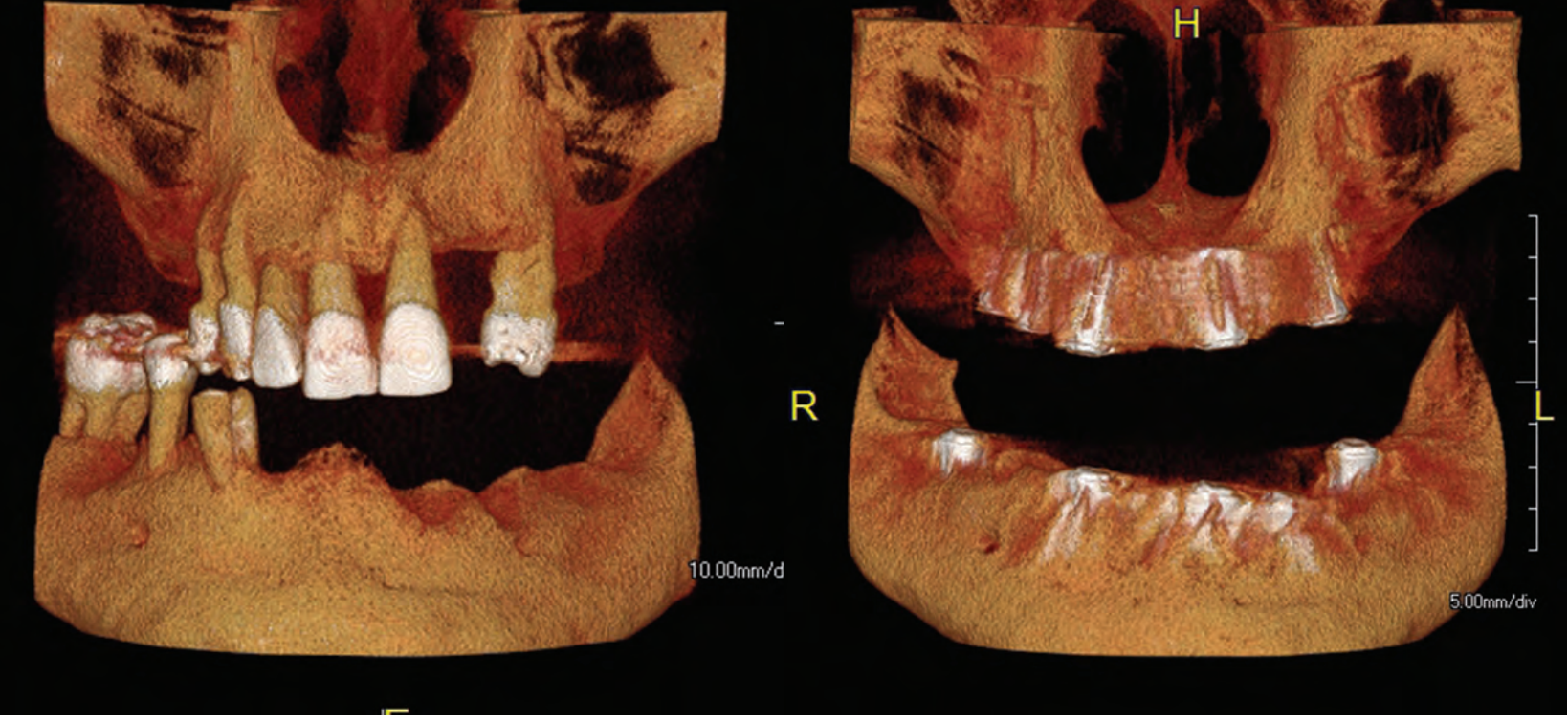
- Clinical Dental Research Program (Washington University)
- MSc in Bone Regeneration (Lisbon University College of Dentistry)



Two-Piece Ceramic Implants for Fixed Metal Free Full Mouth Teeth Replacement

Sammy Noumbissi, DDS MS

Keywords: Zirconia dental implant, Ceramic dental implant, Full mouth reconstruction, Two-piece ceramic implants, Metal free, Hybrid zirconia bridge.

Introduction

Dental implants have revolutionized dentistry and most particularly fixed and removable prosthodontics. Although the success of titanium is undisputable, the widespread use of implants has come with problems ranging from cosmetic concerns the systemic effects on the recipient. There has been increasing reports and research on the long-term stability of titanium and titanium alloys in the body and in the last twenty years in the oral environment[1]. The breakdown of metals and Titanium alloys have been increasingly scrutinized as studies have repeatedly proven that over time during exposure to the oral environment and/or body fluids, titanium particles are found in peri-implant tissues, lymphatics and even distant organs. I recent years, itanium and titanium alloy implant corrosion[2,3] has been identified and proven to be the mechanism by which release of metal ions from the implants to peri-implant tissues occurs. Most recently clinical reports, immunological research[4] have put into question the widely accepted biocompatibility of titanium and titanium alloy implants. As a matter of fact, the search for alternatives started in the seventies with pioneers such as Prof. Sami Sandhaus. The clinical situation presented here is one where metal sensitivity was a concern and although the patient never experienced dental implants in the past, there was concern on his part in having metal alloy implants in his jaws. This is an increasing trend among patients requesting alternative and non-invasive treatment modalities in all areas of health care.

Clinical Case

A 59 years old male presented partially edentulous with severe collapse in the vertical dimension of occlusion. Most teeth were periodontally involved or fractured at the gingival level. The periodontally involved teeth had mobility type II with moderate to advanced bone loss in most cases and gingival recession. (Figure #1) Only three mandibular teeth were present (Figure #2) with no teeth remaining in the mandibular left quadrant and moderate to advanced vertical bone loss. A cone beam CT scan was obtained and reviewed to assess bone levels, anatomy as well as critical anatomical structures in the areas of planned implant placement. The patient had difficulty wearing removable appliances, has a severe gag reflex and requested a metal free fixed solution to replace his teeth. Alternative treatment options were presented including overdentures on four ceramic implants. The patient opted for maxillary and mandibular fixed full arch screw-retained prosthetics using zirconia ceramic implants. A two-phased treatment plan consisting initially of full arch extractions, immediate implant placement in both arches and soft –


Fig. 1

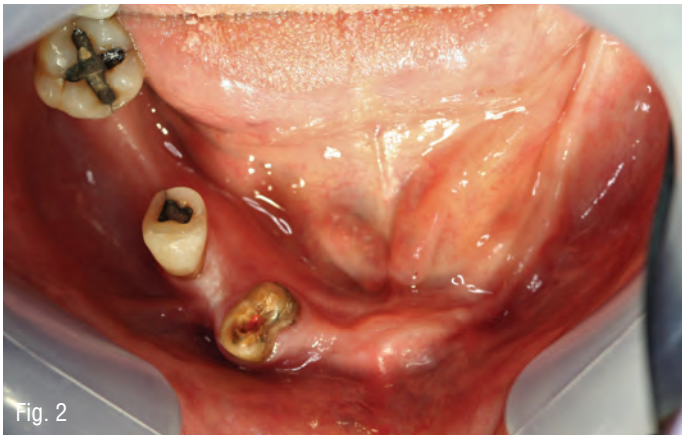


Fig. 2

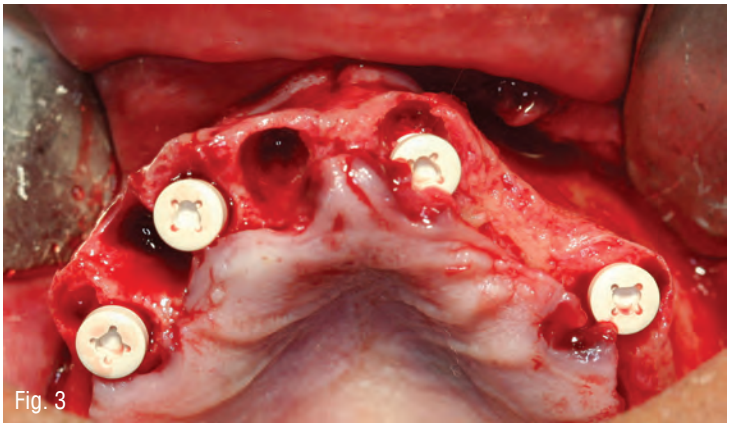


Fig. 3


Fig. 4

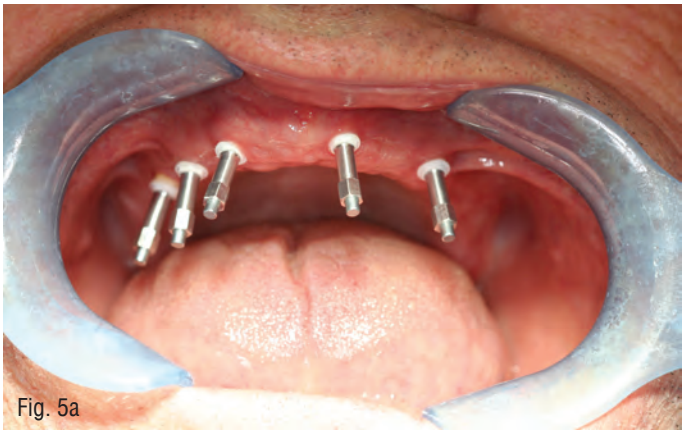


Fig. 5a

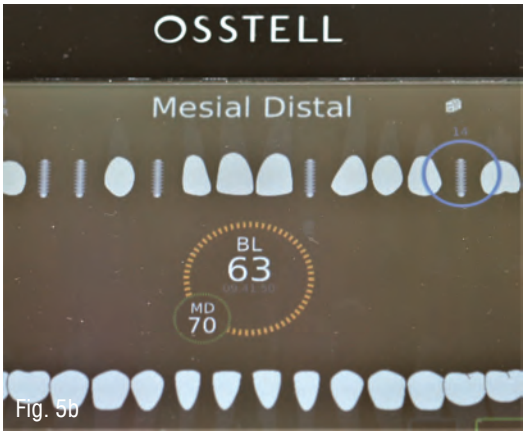


Fig. 5b


Fig. 6

reline of the immediate dentures for both arches. Complete blood work of the patient was done, and particular attention was given to vitamin D3 Levels, RBC Mg (Red blood cell Magnesium), blood cholesterol and HbA1C. Vitamin D3 plays and important role in bone healing and bone formation around dental implants[5,6] and RBC Mg is an activator of Vitamin D37. Furthermore, elevated cholesterol has been well documented to interfere with osteoblastic activity and is often correlated to low Vitamin D3 levels. Vitamin D3 levels were found at 17ng/ml and the patient was placed on a weekly intake of 50,000 IU of Vitamin D3 for 6 weeks and retested. RBC Mg, HbA1C and HDL/LDL cholesterol ratio were all within normal ranges.


Fig. 7


Fig. 8

After six weeks the patient was retested only for Vitamin D3 which was measured at 45 ng/ml and was asked to continue for another 4 weeks post-surgery. The patient returned for surgery, consents were obtained, local anaesthesia was administered across the maxillary arch by infiltration and bilateral posterior superior alveolar blocks. For the mandible, anaesthesia was obtained by means of cross arch local infiltration. Extractions of all remaining teeth was done as minimally atraumatic as possible using manual periotomes and piezo surgery all the while taking care to preserve the buccal plate on both arches. (Figure #3)

Five two-piece ceramic implants were placed in the maxilla as well as in the mandible. The manufacturer surgical kit and protocol was closely followed. Insertion torque value for all implants was 25 Ncm and all implants showed good initial clinical primary stability using the Ostell device. This modality has been well proven and documented to assess implant stability as well as biological readiness for implants to be restored [8].

The Average initial ISQ values at time of implant placement was 65. However, during the osseointegration phase and most likely due to premature stimulation by the temporary removable prosthetics, the bone failed to heal and mature around one of the mandibular implants and it was removed two months after placement. The patient elected not to have it replaced with another implant.

Four months post-surgery the implants were uncovered by removing the soft tissue above the cover screws using a diode laser where needed (Figure #4). The smartpegs specifically designed for the implants were once again screwed into the implants and stability measurements were made. The Ostell device (Figure #5A and 5B) was used to measure the implant stability level for each implant after four months of healing time.

All implants returned average Implant Stability Quotient Values (ISQ) values above 74. Given that the acceptable value range for safe loading of dental implants is between 55 and 85, it was determined that the implants were ready for loading with permanent fixed prosthetics.

Conventional analog impressions were made using polyvinylsiloxane heavy and light body using the closed tray technique. The fabrication of a hybrid prosthesis was started by going through the process of making a conventional denture. Wax rims, wax try-in were done for space analysis, facial contour occlusion, phonetics and aesthetics (Figure #6). Once the waxed prototype was approved, multiple clinical photographs and bite registration were taken for effective transfer of information to the dental laboratory. The zirconia prosthesis framework was manufactured with CAD/CAM technology after scanning of the wax-up prosthesis. A try-in of the framework was done to verify and confirm passive fit to the implants on both arches. The frameworks were returned to the laboratory so that an overlay of pressed ceramic could be fabricated and the prosthesis finalized (Figure #7 and #8).

The screw-retained all-ceramic porcelain fused to zirconia bridge (Figure #9) was connected to the implants; occlusion checked and adjusted where needed. The patient was satisfied with the aesthetics of the prostheses (Figure #10). A soft night guard was provided to the patient (Figure #11). The patient has been followed up periodically for the last twenty-four months and there have been no complications to date.

Conclusion:

Full mouth rehabilitation with two-piece screw-retained ceramic implants is an option. Two-piece ceramic implants are easier to transition into for a clinician familiar with conventional titanium and titanium alloyed implants. However, it should be noted that case selection and rigorous treatment planning are crucial for the success of such rehabilitations. Ceramic implants do not have the prosthetic flexibility and options their titanium counterpart have, therefore biomechanically and prosthetically driven treatment is very important. ■

References available online


Fig. 9


Fig. 10


Fig. 11

The Author

Sammy Noumbissi, DDS MS obtained his Doctorate in Dental Surgery from Howard University in Washington DC. He was then selected to attend the prestigious Loma Linda University Graduate Program in Implant Dentistry. There he received three years of formal training in dental implantology which culminated with a certificate in Implant Dentistry and a Master of Science degree in Implant Surgery. He is a researcher, author and has published abstracts and articles on ceramic implants in peer reviewed dental journals. He lectures nationally and internationally and is the current and founding president of the International Academy of Ceramic Implantology which is an independent association and education provider exclusively focused on metal free and ceramic implantology. Dr. Noumbissi has been practicing and educating dentists on metal free implantology since 2009. His practice and the academy are both located in Silver Spring, Maryland USA.

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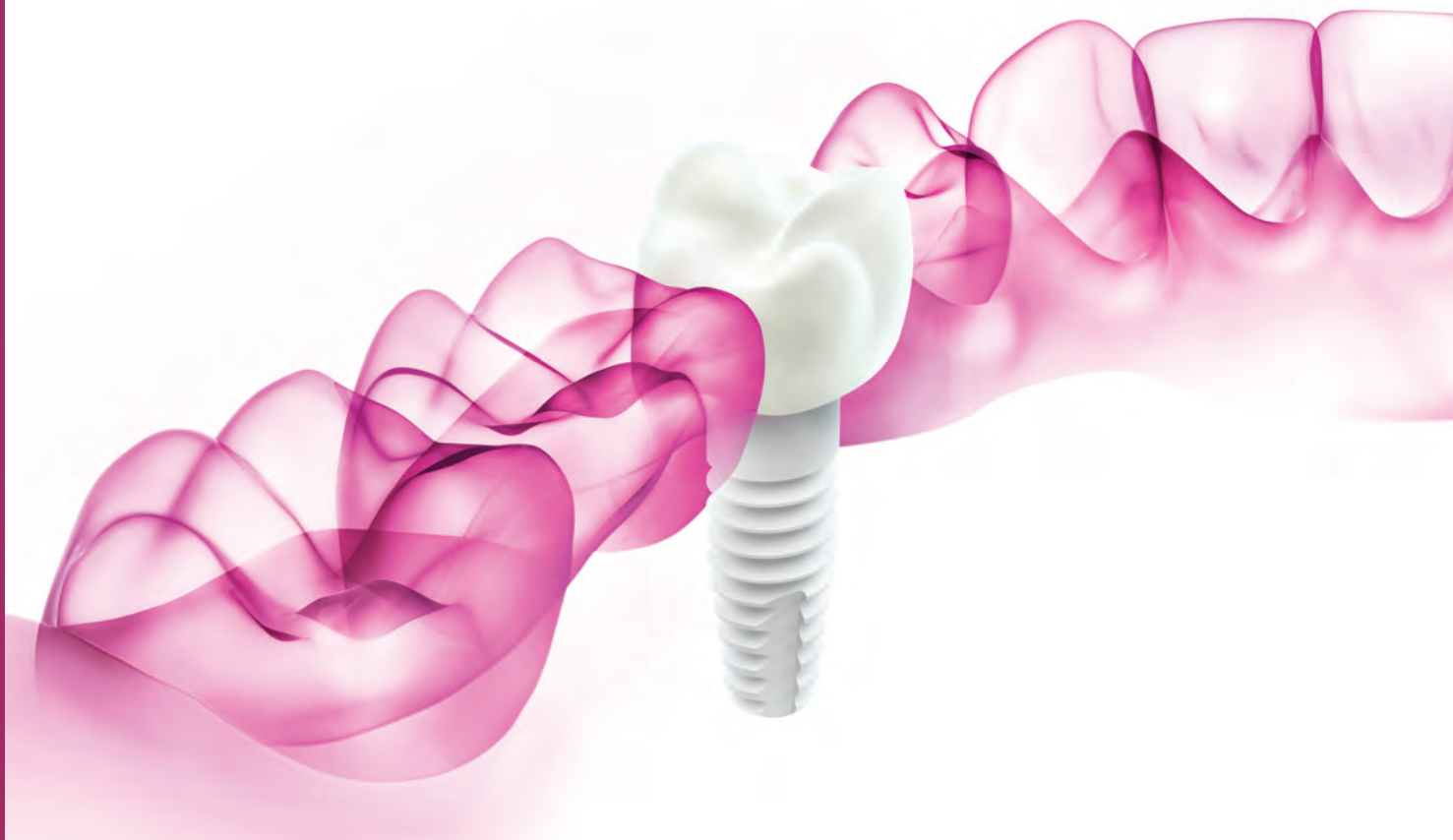

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LECTURE: 8:00AM - 12:00PM
Hands-On: 1:00PM - 3:30PM

The MORNING session will address:

- *Identifying the Three Smile Patterns*
- *The Ten Artistic & Scientific Principles of Smile Design*
- *A methodical approach to score a smile (modified Dental Aesthetic Index mDAI)*

The hands–on afternoon session on anatomical models for the attendees will comprise of:

- *Teeth preparation required to provide minimal-prep veneers*
- *Conventional-prep veneers*
- *Full-wrap veneers*
- *Final Discussion on the Ten Phases of Veneer Treatment*

FOR MORE INFORMATION OR TO REGISTER, CONTACT:

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Dr. Carla Cohn Hands-on course

On June 21st, 2019, PMG held the 'Paediatric Dentistry for the GP' Course with Dr. Carla Cohn.

It was a successful event with 27 registrants in attendance. The course was praised with an abundance of positive feedback by all registrants. The course gave practical points on restorative treatment options and clinical indications for the little patients. A variety of dental materials and procedures in anterior and posterior teeth were demonstrated.

A huge thank you to our speaker for delivering outstanding content and to our sponsors Tokuyama, 3M Oral Care, NuSmile, DMG, Bisco, Garrison Dental Solutions, LLC, Pulpdent & SML, in helping to make this course such a success.

For more information please visit: http://www.torontoimplantacademy.com/

Core 1 course was successful

On May 31st, 2019, PMG held the Core 1 Course with Dr. Aviv Ouanounou (BSc, MSc, DDS, FICO) at the Courtyard by Marriott Hotel in Toronto Northeast/Markham.

It was a successful event with over 60 members in attendance and was praised with an abundance of positive feedback by all attendees. The course provided a full day seminar with two components of Core 1 learning which included the following topics:

- Pain Management and Analgesics Use in the Dental Office: An Overview
- Anti-infectives in the Dental Office: What's new?

A huge thank you to our speaker for delivering outstanding content and to our sponsor P&G, Dental Canada Instrumentation, in helping to make this course such a success.

For more information please visit: http://www.torontoimplantacademy.com/

Dr. Gaum Hand-on Seminar in Calgary

Another outstanding event for Dr. Gaum this past weekend in Calgary, AB! We had a wonderful turnout of 43 Dentists who truly enjoyed the 3-Day Hands-on seminar which was held at Hilton Garden Inn Calgary Downtown. This course allowed registrars to enhance their oral surgery skills which a lecture and hands-on demonstrations under the guidance of Dr. Gaum. Thank you, Dr. Larry Gaum and his Clinical Assistant, Dr. Gordon.

PMG would also like to thank the sponsors: Bio Horizons, Lockstar Dental Lab and Synca Marketing Inc.

Please visit: https://www.drlarrygaum.com/3-daycourses-2019 for the list of 2019 dates or for more information. This course continues to be highly praised from all the participants!

TIA seminar was success again

On Jun 7, the TIA seminar was held at the Courtyard by Marriott Hotel in Markham. It was yet again another successful event with over 50 members in attendance. A great thank you to our speakers, Dr. Bobby Baig, and Dr. Dina Lebowitz and who spoke on 'Digital advancements in Implant Dentistry, Perio-Prostho Challenge in Esthetic Zone restorations' & Mr. Fadi Touma who spoke on 'Digital implant planning design to execution without compromise".

Also, a huge thank you to our sponsors P&G and Dentsply Sirona for contributing in making this a successful event. The next TIA seminar will be held at the same location on Sept 6, 2019.

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