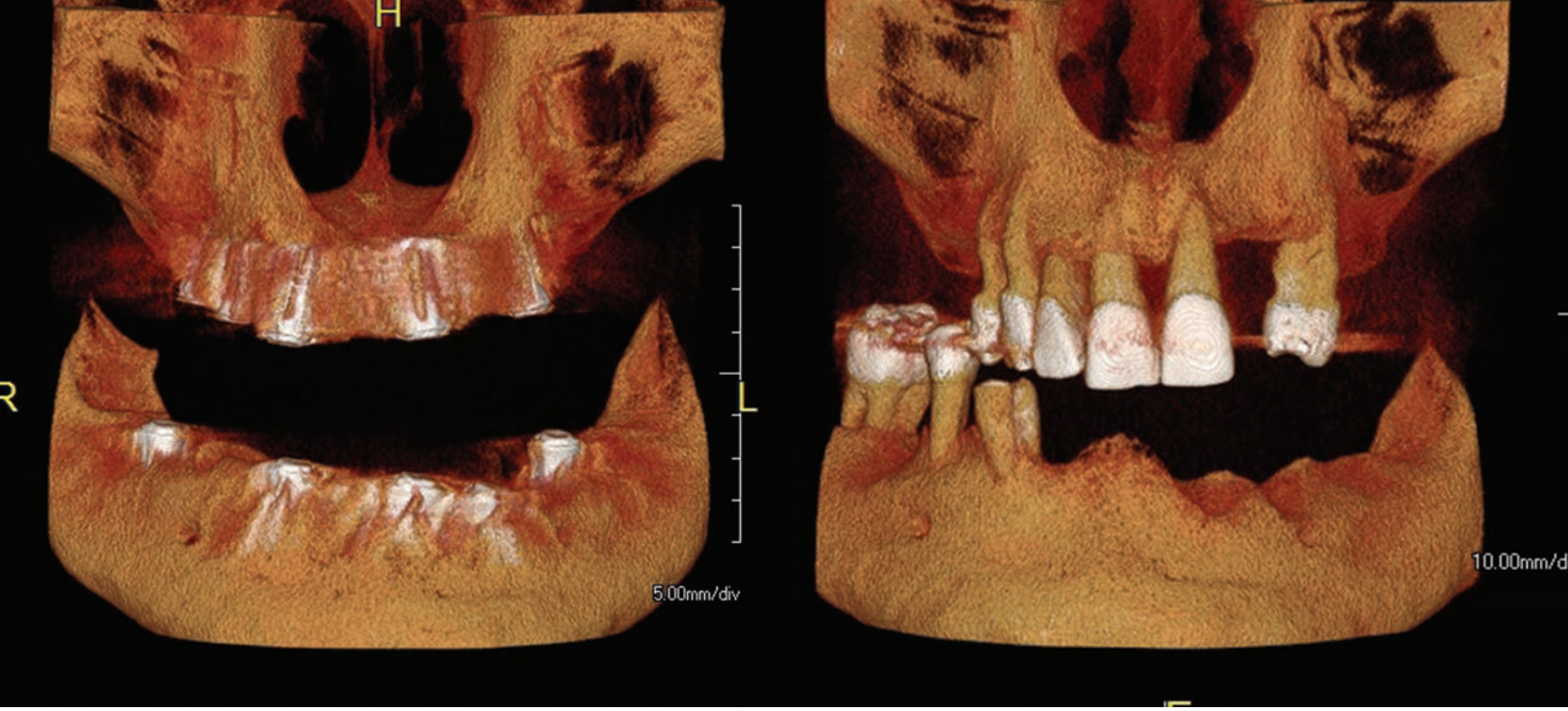


# Two-Piece Ceramic Implants for Fixed Metal Free Full Mouth Teeth Replacement

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**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

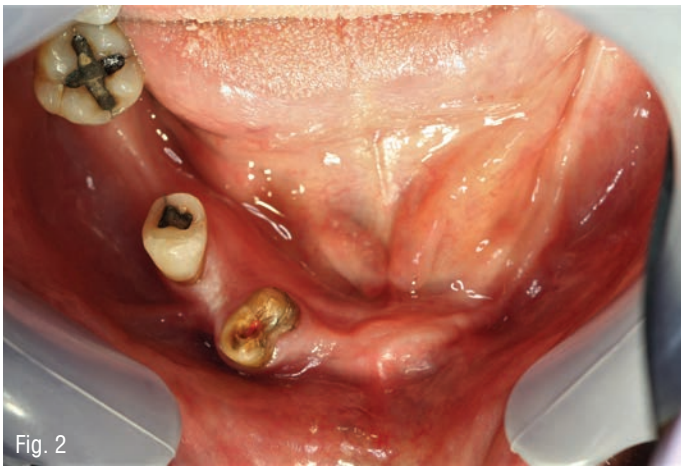
Fig. 2

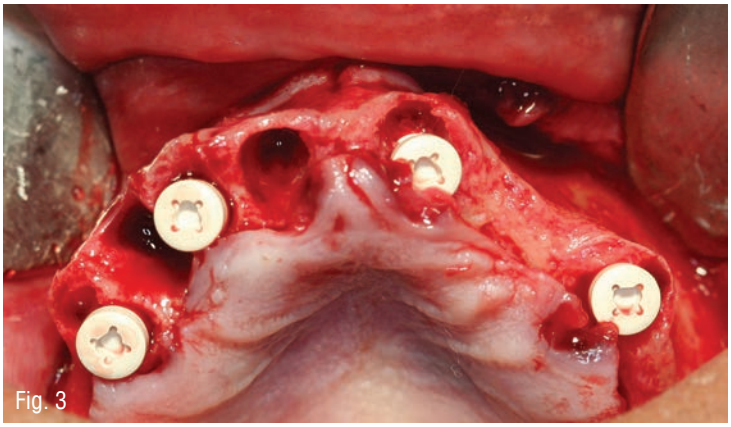
Fig. 3


Fig. 4

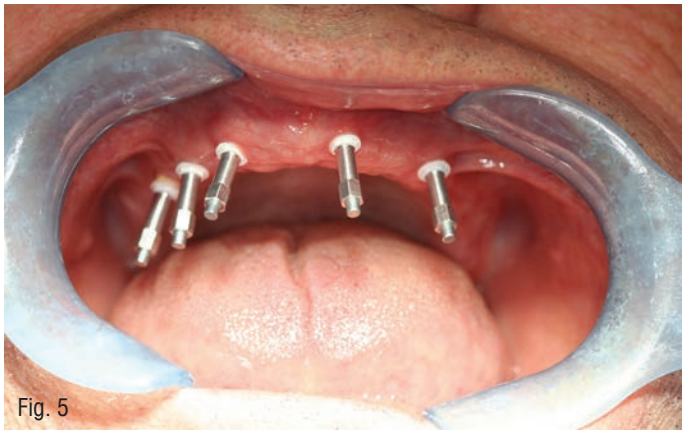
Fig. 5

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. 5a

Fig. 5b


Fig. 6

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 #5, #5A and 5B) was used to measure the implant stability level for each implant after four months of healing time.


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].

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


Fig. 9


Fig. 10


Fig. 11

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. ■

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## 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.