# 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].

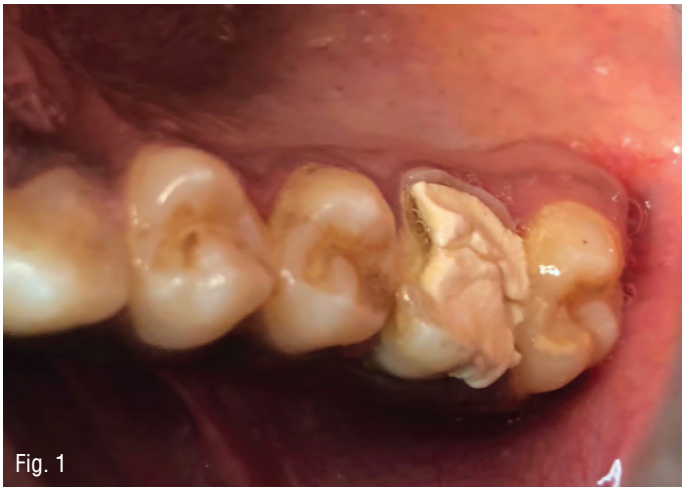


Fig. 1

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].

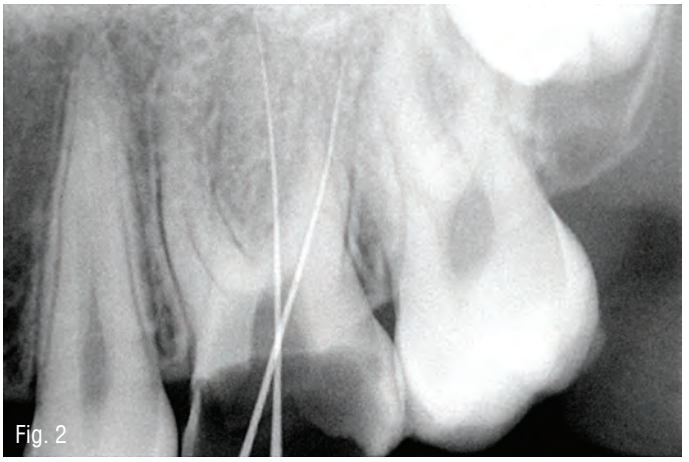
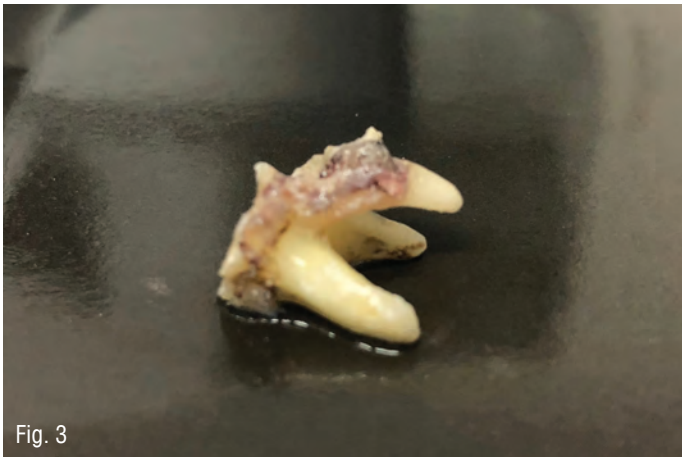


Fig. 2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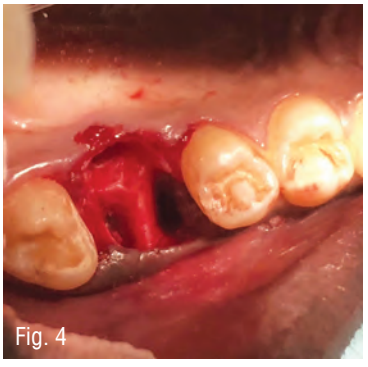


Fig. 4

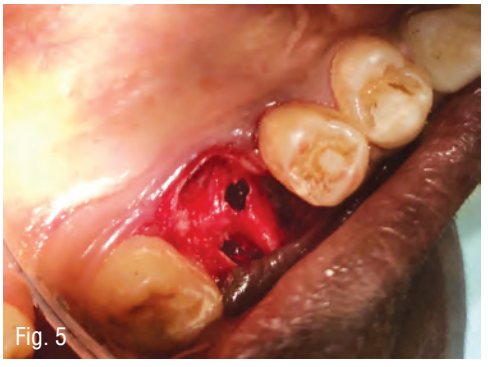


Fig. 5

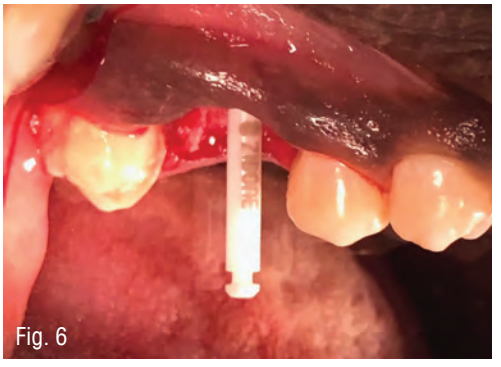


Fig. 6

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.

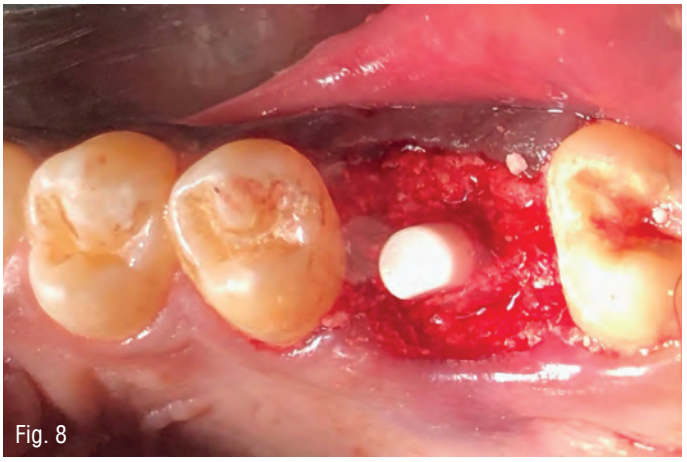
## Surgical Procedure

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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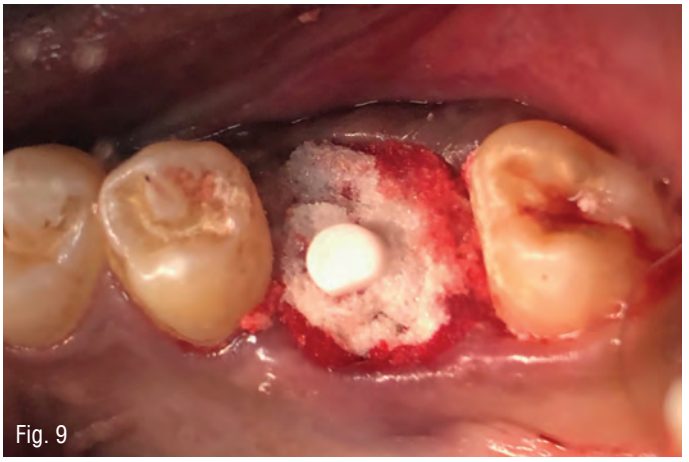
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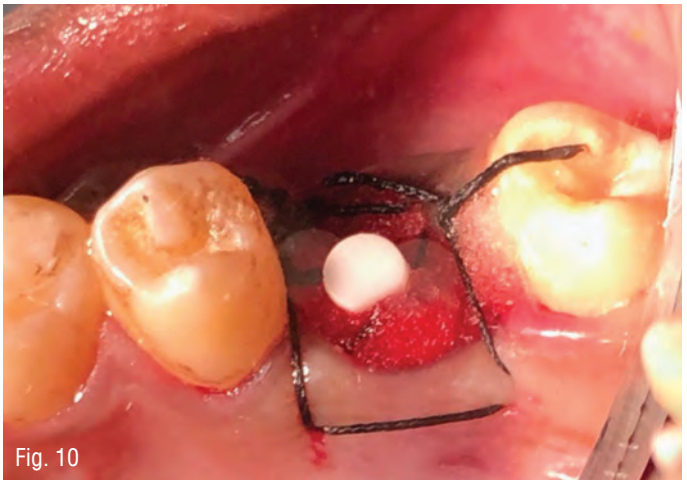
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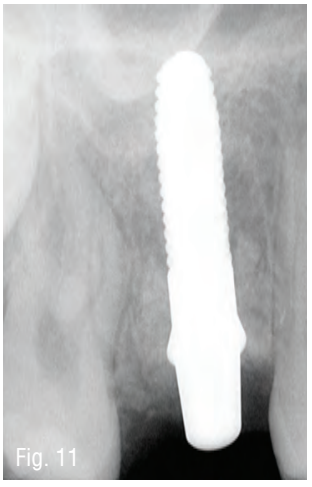
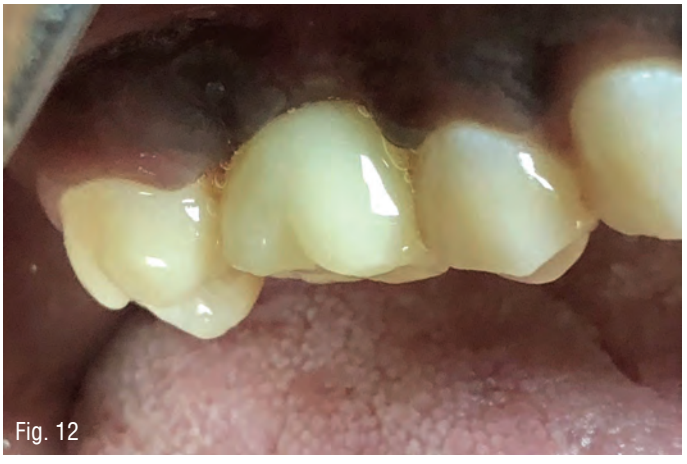


Fig. 11

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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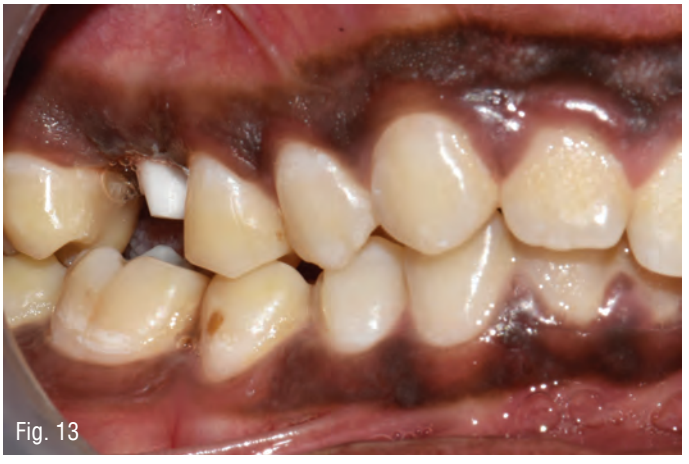


Fig. 13

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.

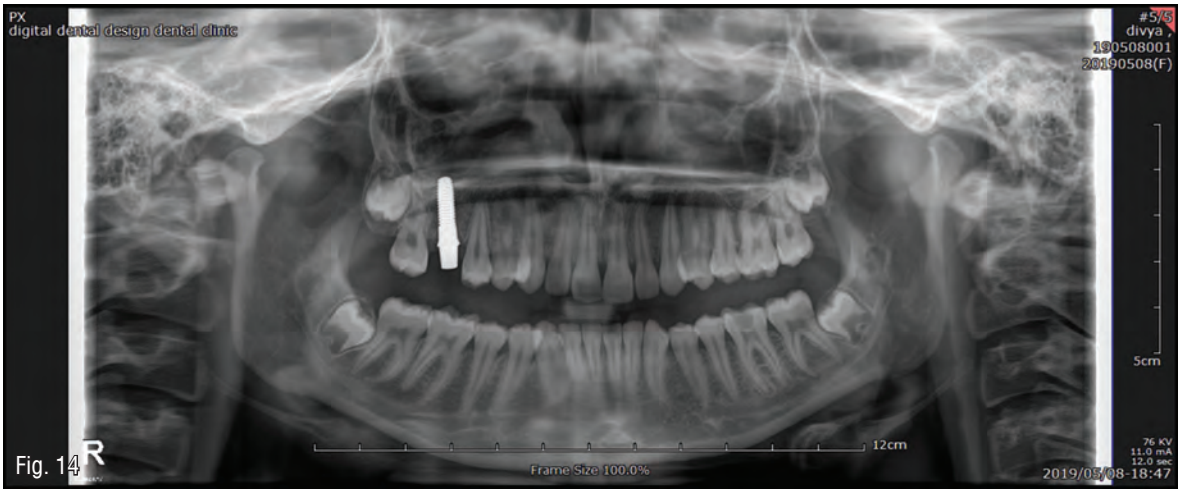
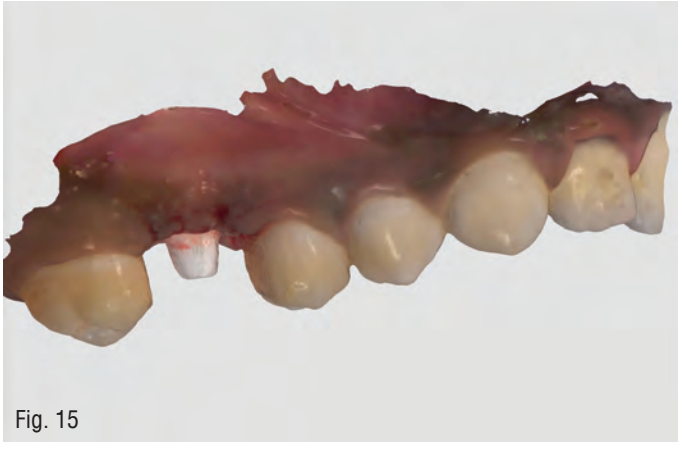


Fig. 14

## 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. ■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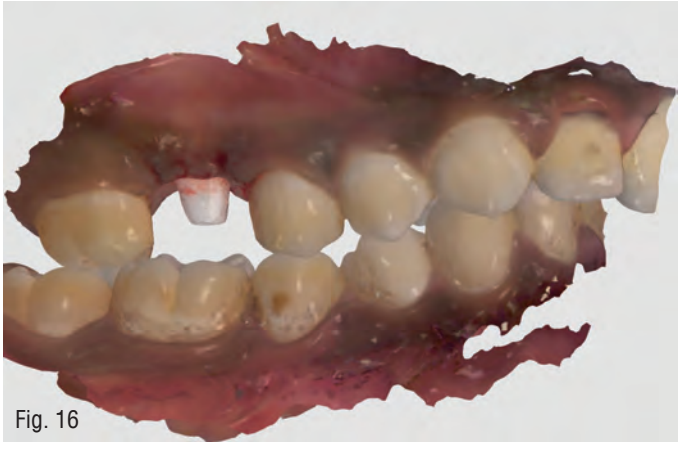
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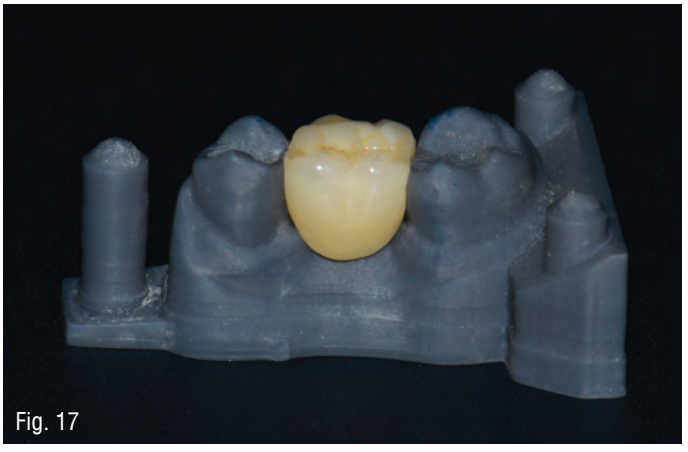
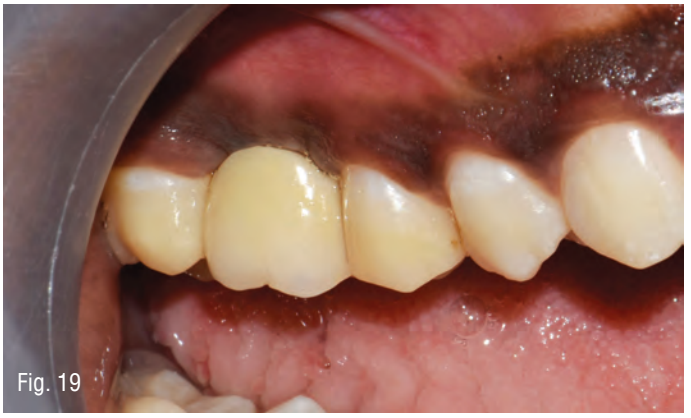


Fig. 17


Fig. 18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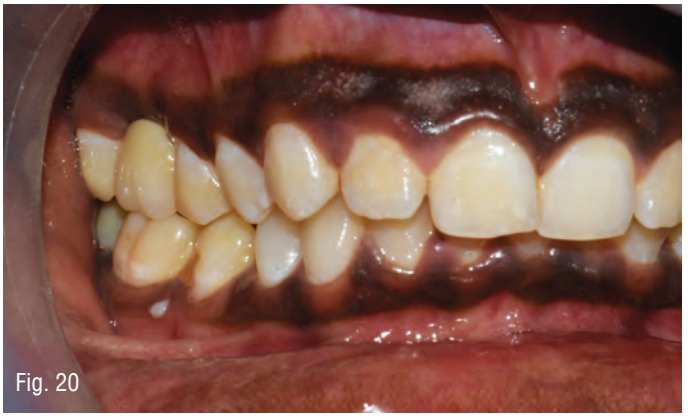
Fig. 20

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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.