

## Customized Implant Full-Mouth Rehabilitation: A Biomechanical Depiction

### Abstract

The rationale for implant full-mouth rehabilitation is believed to present the better quality of life to the older population. This type of modalities preserves the soft and hard tissue of oral cavity. It is also helpful to check the temporomandibular joint disease. Literature exposes that implant full-mouth fixed rehabilitation is one of the taxing procedures in the field of prosthodontics. The current clinical report discusses a customized biomechanical approach for the fabrication of implant complete-mouth rehabilitation. A systematic approach in managing this patient can lead to a predictable and favorable prognosis. This article also presents the stages of prosthodontic rehabilitation from diagnosis to final treatment planning as a customized radiographical Gutta Percha template, precise implant surgery of 12 implants (ADIN, Dental Implant System, Israel) over the both the arches and provisional restorations with group function occlusion. Lastly, full-mouth restorations were fabricated as cement-retained (open hole) metal-ceramic restoration. Advocated patient is absolutely happy with customized implant full-mouth rehabilitation.

**Keywords:** *Acrylic provisional restorations, bite occlusal record, paralleling implants, pattern resin, radiographical cylindrical gutta percha template*

### Introduction

Since the arrival of modern dentistry, it has been a challenging task for a dentist to fabricate a prosthesis which can provide adequate stability, support, and retention to rehabilitate the completely edentulous patient. The profession becomes even tougher when the ridges are grossly resorbed. The conventional treatment option of replacing missing teeth has been replaced by new practices such as placement of implant-supported prosthesis, attachments overdentures, and cast partials.

Surgical placements of dental implants have proved to be a well-documented treatment for edentulism. Treatment success rates are quite highland and postoperative complications are relatively less.<sup>[1-3]</sup> Further, advancements in treatment modalities have progressed to immediate loading and placement of implants without flap elevation to increase the patient comfort and acceptance. Flapless procedures decrease postoperative patient discomfort and intraoperative bleeding.<sup>[4-5]</sup> Although flapless implant surgery has been

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perceived as a blind procedure because of the difficulty in evaluating alveolar bone shape and its angulations.<sup>[6]</sup> The bone width cannot be determined on a two dimensional traditional radiograph and can be difficult to evaluate, clinically.<sup>[7]</sup> Successful implant treatment involves osseointegration of implants that are placed in ideal positions for fabrication of a dental prosthesis.

The principles of “preventive prosthodontics” retained natural teeth should not be extracted. Completely edentulous situation can be avoided by successful rehabilitation by the use of the procedure called “overdenture therapy.”<sup>[8,9]</sup> Overdenture is any removable dental prosthesis that covers and rests on one or more remaining natural teeth, the roots of natural teeth, and/or dental implants (GPT9).<sup>[10]</sup> Overdentures provide a better function than conventional complete dentures, such as increased biting force, chewing efficiency, and increased speed of controlled mandibular movement.<sup>[11]</sup>

The current case report highlights a customized biomechanical depiction of implant complete-mouth rehabilitation<sup>[10]</sup> in the view of clinical laboratory procedures for FP3 prosthesis of metal-ceramic prosthesis.

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## Case Report

A 67-year-old male reported to IDS, Bareilly, for replacement of missing teeth. On intraoral examination, there were only two natural teeth present in the oral cavity #14 and #15 in maxilla. Mandibular arch was completely edentulous [Figure 1]. Clinical and radiographic examination revealed that both the maxillary teeth have Class I mobility. Various prosthetic treatment modalities were explained to the patient. The patient gave the history of severe gag reflex with the prosthesis. Hence, it was decided implant full-mouth rehabilitation in upper and lower arches. Proper case history was recorded for the patient including medical history which was noncontributory, with routine blood investigations, dental and oral examination. Diagnostic impressions and casts were prepared. Computed tomography (CT) scan was done to evaluate the dimensions of the available bone.

Templates in the form of conventional lower complete denture and upper removable partial denture were prepared for mandibular and maxillary arches to decide the right positions of implants (before the surgery). This template was turned into radiographic template with the help of gutta-percha cylinders inserted in the designed and predictable location of implants [Figures 2-4]. In view of this, implants in edentulous maxilla should be planned at least six (ADIN, Dental Implant System, Israel) in quantity as two in canine region two in premolar region and two in molar region. The same total amount of quantity of implants as six is planned in lower, completely edentulous mandibular arch as two in

canine region, two in premolar region and two in molar region.<sup>[11]</sup>

Flapless surgical protocol was planned for 10 implants, while sinus lifting for two implants over each side. Preoperative antibiotics and analgesics were given to the patient. With the help of template placed on the crest of the ridge, after that a lance and pilot drill was carried out. Paralleling tools were placed and checked for angulations of the implant. Sequential drilling was done for placing implants at site in maxilla at #13 (3.0 W/10 L), #15 (3.75 W/8 L), #17 (4.2 W/11.5 L – direct sinus lift), #23 (3.0 W/10 L), #25 (3.5 W/10 L) and #26 (3.75 W/8.0 L – indirect sinus lift) and while in mandible, the sequential drilling is done at #33 (3.75W/13 L), #34 (3 W/10 L), #36 (4.2 W/6.2 L), #43 (3.75 W/13 L), #44 (3.75 W/11.5 L) and #45 (3.0 W/10.0 L), in the osteotomy site. Per mucosal extensions were placed. Postoperative care has been administered with antibiotics, analgesics and mouthwash. The maintenance of oral hygiene was emphasized. Immediate loading was done by converting surgical template into conventional complete denture by sealing the gutta-percha cylinder holes of template with autopolymerizing resin and relining it with

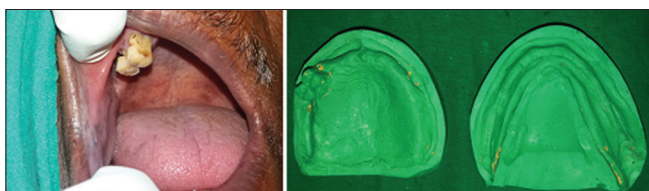


Figure 1: Preoperative



Figure 2: Radiographic template

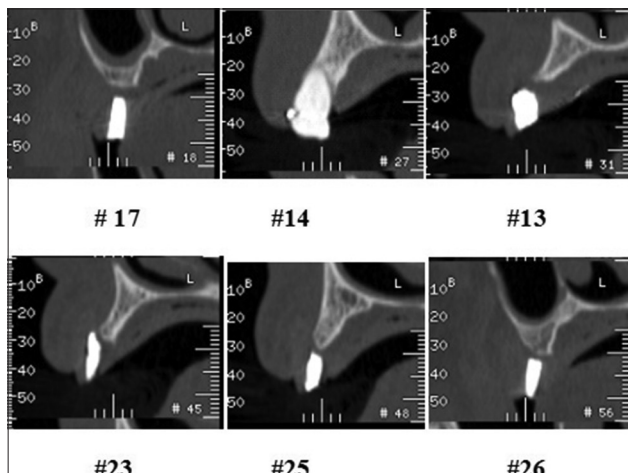


Figure 3: Maxillary computed tomography scan

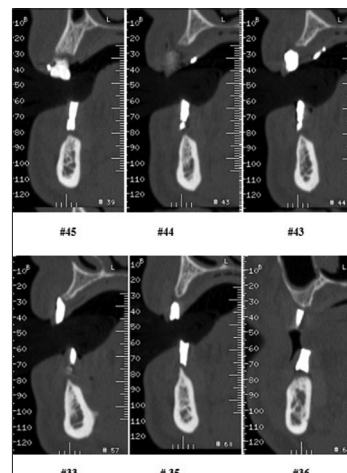


Figure 4: Mandibular computed tomography scan

tissue conditioner. After 4 months, the patient was recalled. The abutments were placed over the implants and thereafter implants prosthesis were fabricated [Figure 5].

### Prosthetic phase

#### *Recording of impression*

The postoperative CT scan was made and checked for proper osseointegration after 6 months. Open impression tray analogs are placed and impression is the foremost step which is made with elastomeric impression material (Photosil, DPI India) with double mix technique. Implant analogs were threaded to the impression analog in both the impression trays and a layer of esthetic mask silicon-flexible material (Detax, Germany) is also applied around the implant analog. Subsequently, upper/lower cast was poured [Figure 6] into die stone (Type IV- Kalabhai, Bombay). All 12 abutments are threaded over the models and checked for parallelism among each other and blocked with block-out wax.

All abutments unthreaded and placed in the patient mouth and again checked and modified for parallelism among the abutments in the observation of 10° taper. Alginate impression was recorded for both the arches and upper and lower models poured with self-cured acrylic resin and cured under the pressure pot [Figure 7]. In view of the next procedure, the maxillary and mandibular, putty indexes of occlusal rims were fabricated over the acrylic model. These putty indexes were finally adjusted into the patient mouth with modeling wax in the view of occlusal rim and interocclusal gap.

#### *Jaw relations and provisional restoration*

Horizontal and vertical records were obtained with occlusion rims over the acrylic model and transferred to a semi-adjustable Hanau Wide-View articulator using a face bow [Figure 8]. Afterward, full mouth provisional restoration was fabricated with self-cured, tooth colored acrylic polymer (SC 10 AV, Delhi) for both the arches.

Acrylic full-mouth provisional restoration is positioned in the patient oral cavity over the both the arches and fixed with temporary cement with the IRM, type III and class 1 material. The occlusion was kept class 3, edge-to-edge, and group function [Figure 9]. The IOG (Inter Occlusal Gap) is kept and maintained as 6.00 mm. The patient was evaluated after 21 days. The patient gave a positive history for prosthesis in relation to speech, mastication and precision. Next to it, an occlusal bite record was recorded with bite registration material (Ramitec Polyether, 3M, USA) [Figure 10].

#### *Fabrication: Framework of casting patterns and ceramic layering*

Abutments were again placed over both the upper and lower dental stone cast and framework of casting patterns

were fabricated from the Pattern Resin (GC Corp. Japan) for each arch for fixed prosthesis [Figure 11] after surveying and blocking the undercut with the block out wax. The pattern over the each abutment has been carved for a hole. The full-arch pattern of both the arches was then sprued, invested, burnout and casted into base metal alloy (4 all Ivoclar, vivadent, Germany). Casting was done with induction casting machine (Ducatron, Ugin, France). After retrieving framework of casting from the investment, it was finished and its fit was first evaluated over the stone cast and after that into the patient mouth [Figure 12].

Later on, ceramic (VITA VMK Master, Germany) buildup was done first over the mandibular framework in rapport to occlusal scheme of maxillary provisional restoration [Figure 13]. Final prosthesis was fabricated in relation to group function occlusion in class 3 incisal relation as upper and lower edge-to-edge movement. Both the arches, prosthesis were cemented with GC gold luting cement Fuji type I [Figure 14]. Oral hygiene instructions were given to the patient and proper follow-up was done after 1 and 3 weeks. The patient gave positive response without any complaint.

### Discussion

Proper diagnosis and treatment planning is key to any successful mouth rehabilitation. Implant Full-mouth rehabilitation is also designated as implant complete mouth rehabilitation.<sup>[10]</sup> Treatment modalities have to be modified as per the need of the patient. Retention can be increased by means of overdentures using attachments. Careful assessment of vertical space was evaluated.<sup>[12]</sup> Successful implant treatment involves osseointegration of implants that are placed in ideal positions for the fabrication of a dental prosthesis.<sup>[7]</sup> Extensive preoperative planning and treatment coordination are necessary for treatment success. Imaging tools, a diagnostic wax-up and a surgical guide, along with a good understanding of anatomy and surgical principles, are essential.

The numbers of implant is decided by Misch Classification of treatment option no. 1 out of five options.<sup>[11]</sup> Radiographic templates help in proper positioning of implants; therefore, proper load distribution will occur.<sup>[13]</sup> Mal-aligned dental implants result in complicating the clinical and laboratory procedures employed in the fabrication of superstructure prosthesis. Due to improper implant placement, improper load distribution will result in the overall increase in stress concentration on supporting structures and implants. This will compromise the maintenance of bone-implant interface. Use of advocated provisional restoration framework is very much necessary before the fabrication of permanent framework to decide the occlusal scheme, IOG and performance. Framework of pattern resin helps in delineating the fair cervical lines, totally.<sup>[14]</sup> This

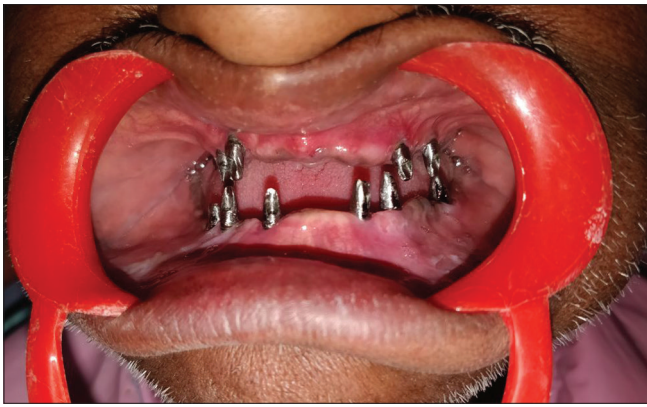


Figure 5: Intraoral view: abutments



Figure 6: Upper and lower stone cast with abutments



Figure 7: Self-cure resin model



Figure 8: Occlusal rims record over the putty index record



Figure 9: Complete-mouth rehabilitation: Provisional restoration with group function occlusion

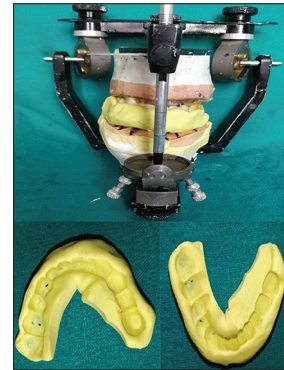


Figure 10: Bite registration record along with mounting



Figure 11: Pattern resin framework (mandibular arch)



Figure 12: Casted metal framework

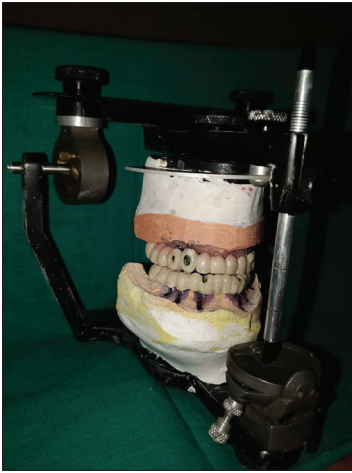


Figure 13: Complete ceramic work: semi-adjustable articulator

is accomplished by further mounting of provisional restorations on the semi-adjustable articulator with the help of recorded bite occlusal record. Occlusal scheme is decided as group function.<sup>[11]</sup> This scheme was also accepted by the patient. The rationales of current case report are the use of customized radiographic cylindrical gutta percha stent,<sup>[13]</sup> full-mouth provisional restorations and open hole cement-retained full-metal ceramic restorations. Open hole cement-retained restoration will facilitate the easy removal and insertion of full arches prosthesis.

### Conclusion

Full-mouth rehabilitation entails the performance of all the procedures necessary to produce a healthy, esthetic, well functioning and self-maintaining masticatory mechanism. This clinical report illustrates the value of thorough diagnosis with the CT scan. The patient's response to provisional restoration was assessed, first and then implemented in the final restorations. The radiographic template helped the clinician in the view of parallelism of implant placement. The advocated implant complete-mouth rehabilitation technique is more concrete, logical and considerable.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.



Figure 14: Complete-mouth rehabilitation: *in situ*

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