

# FULLY GUIDED ALL-ON-4 TECHNIQUE: A CONTROLLED APPROACH

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<https://doi.org/10.55231/jpid.2023.v07.i01.01>

## Abstract:

*Edentulism is a commonly occurring condition in elderly and rehabilitation becomes pertinent to restore the lost function. Single stage surgical protocols with immediate restoration of function has emerged as an effective treatment approach over the past years. All-on-4 approach, avoids the complicated procedures of bone grafting and ridge augmentation and delivers immediate restoration. A fully guided all-on-4 surgery minimizes the risks and errors involved with free hand surgery especially in the maxillary arch, and provides a more controlled approach with predictable outcomes. A combination of 3D planning and surgical template, the all-on-4 protocol, and immediate functional loading is used in this case report.*

**Keywords:** All-on-4 concepts, Fully guided surgery, Radiographic template, Dental implant, Edentulism, Immediate prosthetic rehabilitation.

## Introduction

Loss of teeth can have a negative functional as well as psychological impact on an individual. This

loss can be the consequence of various factors such as caries, improper oral hygiene further leading to periodontal diseases. Edentulism has been shown to have an adverse effect on quality of life as well as overall health of the patient.<sup>1</sup> Various treatment modalities have been used to rehabilitate the edentulous arches aiming at restoring the functional efficacy as well as esthetics of the patient. Conventional complete dentures have been a routinely done treatment option from way back. However, poor stability, compromised retention, reduced oral sensory function and problems associated with denture care and handling are a few of the reasons for patient dissatisfaction.<sup>2</sup> Also, the mental satisfaction of a fixed prosthesis is what draws the patients towards implant supported prosthesis over a conventional removable denture. An osseointegrated implant supported fixed prosthesis makes the final treatment result more predictable and acceptable to the patient. Immediate loading of implants have emerged as a reliable treatment approach with high success rates and more predictable outcomes over long term follow ups.<sup>3,4</sup> Immediate rehabilitation enhances the end result with appreciable esthetics, phonetics as well as

functional productivity, making the final prosthesis more admissible.<sup>5,6</sup>

Rehabilitation of atrophic edentulous arches with implant supported prosthesis is a prosthetically complex situation and often involve placement of tilted implants based on the availability of bone for achieving osseointegration as well as the resultant optimum implant stability. Various anatomic factors such as proximity to the inferior alveolar nerve in the mandibular arch and excessively pneumatized maxillary sinus can pose a hindrance to the traditional implant placement. All-on-4 concept first came into light from the concept of Malo et al. and has evolved over time. It presently utilizes a combination of 2 straight anterior and 2 tilted posterior implants, hence providing enough support to maintain a full-arch fixed prosthesis. Angulation of distal implants provides numerous biomechanical and clinical advantages for fixed restorations with less invasive techniques when compared with grafted

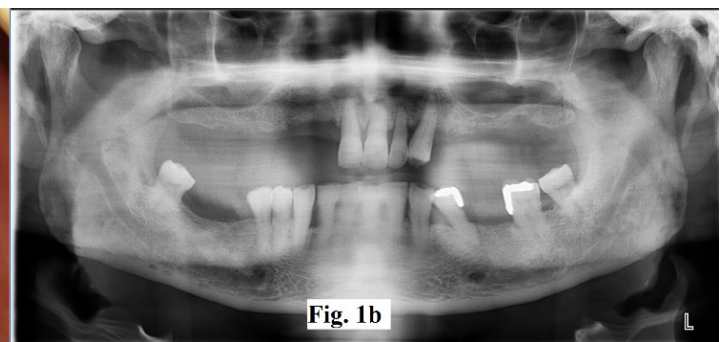
procedures with traditional axial implants.<sup>7</sup> A fully guided surgery making use of a customized surgical template ensures an accurate diagnosis and treatment planning followed by a precise implant placement enhancing the accuracy of the final prosthesis. In this case report, we describe a controlled approach of rehabilitating edentulous arches with fully guided all-on-4 implant surgical protocol followed by immediate provisionalization.

## Case Report

A 60 year old male reported to the Department of Prosthodontics with the complaint of difficulty in mastication due to missing teeth in maxillary posterior region. On intraoral examination, 11, 21, 22 and 23 were present in the maxillary arch (Fig.1a) and the teeth were Grade 2 mobile. Teeth number 34, 36, 46 and 47 were missing in the mandibular arch. Radiological examination revealed the vertical as well as horizontal bone loss around the maxillary teeth (Fig.1b). Considering the



Fig. 1: 1a- Pre-op clinical examination



1b- Pre-op Radiograph



Fig. 2a



Fig. 2b

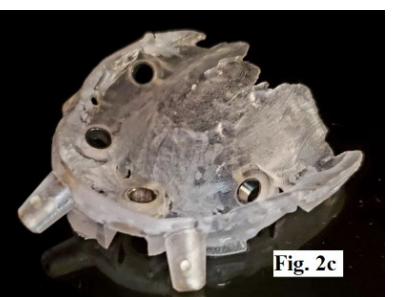


Fig. 2c

Fig. 2: 2a- Treatment planning 2b- Diagnostic radiographic template 2c- Surgical template for fully guided surgery

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amount of bone loss and mobility associated, the patient's inclination towards a fixed prosthesis and declination for an invasive surgery, extraction of the remaining maxillary teeth was planned followed by rehabilitation with all-on-4 technique. According to Bedrossian classification,<sup>8</sup> our case fell into the category where in bone is present in Zone I and Zone II only guiding us to a prosthetic option of rehabilitating the anterior maxillary region with traditional implant placement and posterior maxillary region with tilted implants. Hence, an All-on-4 approach of rehabilitation was planned for the maxillary arch (Fig.2a) and conventional implant placement was planned for replacing the missing teeth in the mandibular arch. A fully guided All-on-4 surgery was planned using Nobel Guide. Firstly, a diagnostic radiographic template was fabricated (Fig.2b) to assist in acquisition of radiographic scans required for planning the final implant positioning and further for the fabrication of a fully guided surgical template to be used during the surgical procedure. For the fabrication

of the radiographic template, a preliminary impression of the maxillary arch was made using irreversible hydrocolloid and stone model was poured. A tentative jaw relation of the patient was recorded and the maxillary and mandibular casts were articulated using this relation. Following this, a transparent complete denture was fabricated for the maxillary arch keeping in mind the esthetics, phonetics and occlusion with respect to mandibular arch. This transparent denture was to serve as the diagnostic stent. This stent was sectioned in two parts, one anterior part corresponding to the anterior maxillary teeth present in the patient's mouth and one posterior part for the posterior edentulous maxillary arch. Radiopaque markers were incorporated within the diagnostic stent corresponding to the final implant position required for the procedure. The posterior section of the stent was seated in the patient's mouth and 3D CBCT scans were recorded. Thereafter, the anterior and posterior sections of the diagnostic stent were assembled on the maxillary cast modified

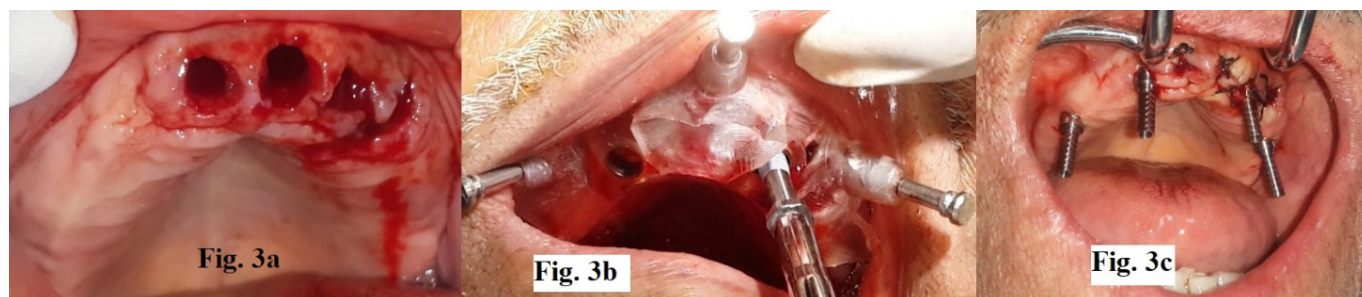


Fig. 3: 3a- Atraumatic extraction of anterior maxillary teeth; 3b- Surgical template seated in the maxillary arch; 3c- Placement of abutments- straight for anterior and tilted abutments for posterior implants.



Fig. 4: Post-op Radiograph

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earlier, and a second scan was made. Both these scans were then utilized for the final treatment plan. A customized surgical template (Quick guide, Nobel Biocare) was fabricated accordingly (Fig.2c), to assist the implant placement ensuring the optimum inclination and alignment enhancing the final prosthetic outcome. A provisional denture was fabricated prior to the surgical procedure using heat cure acrylic resin for immediate provisionalization post implant placement.

Following the routine protocol before implant placement, 500 mg amoxicillin was prophylactically given to the patient 1 h before surgery and rinsing was done with povidone iodine mouth rinse. Surgical site and adjacent area was scrubbed with betadine. Infiltration anesthesia was given. After profound anesthesia, the anterior maxillary teeth were luxated and extracted atraumatically (Fig.3a), following which the surgical template was tried

and adapted to the maxillary edentulous arch with the help of orientation pins of the guide (Fig.3b). According to the manufacturer's guidelines (All-on-Four procedures and products, manual No. 16896 Lot GB 0603, Nobel Biocare Services), to avoid counter sinking, the implant sites were underprepared thus increasing cortical bone support. Four implants of dimensions 4.3x15mm each (NobelActive, Nobel Biocare, Switzerland) were selected for the anterior as well as the posterior regions of the maxillary arch. Following implant placement, final implant torque was checked with a surgical torque wrench and verified with the ISQ values. Multi-unit, straight abutments for anterior implants and 35° angulated abutments for the posterior implants along with titanium cylinders (Fig.3c), were connected post the implant placement and tightening was achieved upto 35 Ncm with a manual torque wrench. A post-op radiograph was done to verify the alignment of implants and the



**Fig. 5a**



**Fig. 5b**

Fig. 5: 5a: Titanium cylinders picked with Q resin within this denture.

5b: Provisional denture seated in the patient's mouth



**Fig. 6:** Final prosthesis placed after 3 months.

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abutments (Fig.4). The prefabricated maxillary provisional denture was then seated and modified, and titanium cylinders were picked with Q resin within this denture (Fig.5a). This provisional denture was then finished & polished and was seated in the patient's mouth the same day (Fig.5b). For the rehabilitation of missing teeth in the mandibular arch, a conventional implant placement procedure was followed. Routine follow up visits were scheduled at 1 week, 1 month and 3 months after the surgical procedure and steps for fabrication of final prosthesis were initiated at 3 months appointment (Fig.6).

## Discussion

Full arch rehabilitation in patients is always demanding functionally as well as esthetically. The All-on-4 treatment concept optimizes the available bone and allows for the rehabilitation of edentulous jaws, eliminating the need of a bone graft, in one surgical step through the placement of 4 implants—two anteriorly and two posterior implants angled between 30-45 degrees commonly placed anterior to maxillary sinus. The main objective of an all-on-4 approach is to obtain bicortical anchorage for functional loading. Restoration of posterior atrophic maxilla with a traditional implant supported prosthesis demands bone grafting, sinus or ridge augmentation procedures as an adjunct. However, increased cost as well as the treatment time along with additional surgeries and comorbidities associated with these procedures calls for a more safer and predictable alternative. Tilting the posterior implants eliminates the requirement of the above mentioned surgical adjuncts along with increasing the anterior-posterior (A-P) spread thereby shortening the cantilever, which along with the cross-arch stabilization, enhances the implant/prosthetic outcome. Use of longer implants can be employed further enhancing the load distribution. Angulation of distal implants in a 30 to 45 degree position relative to the occlusal plane allows the final prosthesis to have 10 to 12 teeth per arch.<sup>9</sup> To

minimize the cantilever, the posterior osteotomies should be started as posterior as possible allowing a distance of approximately 4mm from the anterior wall of the sinus. The posterior osteotomies are tilted to the maximum angle to the 45°, so that the posteriorly tilted implants are placed a minimum 2 mm anterior to the anterior wall of the sinus. Achieving this precise angulation along with the bicortical anchorage can be challenging especially in the maxillary arch and requires skill and expertise while performing a free hand surgery. A fully guided surgery avoids these risks and makes the surgical procedure more controlled and predictable with desired prosthetic outcomes improving the overall success rate of the final prosthesis. It accomplishes a precise diagnosis as well as a meticulous treatment planning and provides for an accurate and precise implant placement minimizing the likelihood of errors and reducing the overall treatment time.<sup>10</sup> Utilizing the available bone to obtain the optimal primary stability helps in immediate functional restoration of the dental function. Immediate provisionalisation can be implemented following achievement of primary implant stability of 35Ncm or higher. Immediate rehabilitation improves the patient acceptance of the final prosthesis, functionally and esthetically.

## Conclusion

Rehabilitation of edentulous arches with All-on-4 technique is a predictable treatment modality with excellent success rates with a high survival. Overall hygiene is also improved owing to the spread of the four implants. In this technique we have made use of a 3D planning and fully guided surgery for the All-on-4 procedure in the maxillary arch followed by immediate provisionalisation, complementing the advantages of each one of these. The final result being a more precise technique with less risks. In totality, this technique demonstrated exceptional aesthetic outcomes, without any complications, with a reduced treatment time.

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