Full Mouth Rehabilitation of the Maxilla and Mandible with Implant-Supported Prostheses: A Case Report

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ABSTRACT

The placement of dental implants in severely atrophic arches is not a straight-forward procedure. In such situations, the All-on-four protocol provides a simple alternative. The placement of four implants—two straight and two tilted— in these clinical scenarios allows clinicians to place fixed provisional restorations that are immediately loaded, and the patient can function with. This approach results in more simplicity, less treatment time, less patient morbidity, and immediate function. The provisional restoration is replaced by the permanent restoration after the period of osseointegration. Furthermore, incorporating surgical guides in the treatment allows for precise and controlled placement of implants that is confirmed during the treatment planning stage.

Key words: Dental Implants; Dental Prosthesis; Implant-Supported Mouth; Edentulous

INTRODUCTION

The "All on four" treatment protocol is a well-established treatment option for the rehabilitation of the fully edentulous condition with less than optimum bone dimensions.[1-3] It involves the placement of four implants—two axial and two angled—into the anterior aspects of the maxillary or mandibular arches.[4] The placement of these implants is intended to avoid the maxillary sinus and inferior alveolar nerve in highly atrophic ridges.[5] They can be immediately loaded with immediate provisional prostheses with a maximum of one tooth cantilever.[6] After the period of osseointegration is completed, the final restoration is a single-piece screw-retained prosthesis that splints all the implants together and also includes a distal cantilever that increases masticatory contacts.[5]

Bone volume and density,[7] and soft tissue characteristics[8] are important parameters to consider when placing dental implants. Implant site modification by vertical bone augmentation, sinus lifts, and soft tissue surgeries do not always result in predictable results. Furthermore, these procedures lead to more complex treatment plans, increased patient morbidity, and longer treatment times compared to the All-on-4 protocol. As such, the All-on-4 concept was aimed to work with the minimal amount of bone remaining in atrophic jaws. It also aims to minimize the edentulous period during osseointegration and reduce additional surgeries.[9]

A challenge faced with implant surgeries for full arches is the correlation of sites studied radiographically and their clinical counterpart.

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This problem can be effectively solved by the use of surgical guides. They allow us to plan edentulous sites that are to receive implants of specific sizes, and accurately place the same in their intended three-dimensional positions.[10]

The following case report describes a case wherein the patient underwent total extraction. The posterior ridges had minimal bone height and width. Upper and lower implants were placed on the same day using surgical guides following the All-on-4 protocol. Provisional prostheses were placed on the same day. Final prostheses were delivered after three months.

CASE REPORT

A 49-year old male patient visited the clinic with the chief complaint of mobile teeth and an inability to chew his food efficiently. On clinical examination, the patient was diagnosed with Grade IV Stage C periodontitis (Figure 1-3). The treatment plan decided upon was total extraction and All-on-4 prostheses for the upper and lower arches. The patient did not want removable prostheses. Surgical guides would be used for implant placement and a pre-fabricated implant-supported provisional would be delivered on the day of the surgery.

Full mouth CBCTs and a digital impression were obtained (Figure 4). The vertical dimension of occlusion for the patient was satisfactory, and was planned to be replicated in the provisional prostheses. Digital planning of the implant positions was done with the dental laboratory over multiple Zoom meetings. Bredent blueSky (Bredent Group, Bredent GmbH & Co.KG, Germany) implants were planned to be placed in the following locations—15 (4x10mm), 13 (4x14mm), 22 (4x10mm), 25 (5.5x12mm), 45 (4x14mm), 43 (4x12mm), 33 (4x12mm), 35 (4x14mm). The sites of implant placement were largely done factoring in bone availability, location of the maxillary sinus and inferior alveolar nerves, and A-P spread. The upper and lower surgical guides were designed to be tissue-borne, and tooth-tissue borne respectively. The lower third molars were not extracted initially as they were included in the guide design.

On the day of the surgery, after achieving adequate anesthesia, all remaining teeth were extracted except the lower third molars. The extraction sockets were carefully curetted. This was followed by photodynamic therapy using Helbo Photodynamic Therapy (Bredent Group, Bredent medical GmbH & Co.KG, Germany) (Figure 5). The upper surgical guide was checked intraorally to ensure proper seating followed by anchoring them in position using fixation pins. Osteotomies were prepared (Figure 6). The planned implants were placed with insertion torques of 40-45 Nm. No flaps were raised. The lower implants were placed in the same manner. Insertion torques ranged between 45-50 Nm.

Once the surgical part was completed, multiunit abutments were placed on all 8 implants taking care to achieve a common path of insertion for the upper implants and lower implants respectively. Metal cylinders were then fixed to the multiunit abutments. The upper prefabricated provisional prosthesis was then tried in. It was then picked up along with the metal cylinders using diacrylate resin (Qu Resin, Bredent Group, bredent GmbH & Co.KG, Germany). The same procedure was completed for the lower arch. Thereafter, both provisional prostheses were removed. The excess metal cylinders were cut. Bis-acryl was added to the intaglio surface to remove all concavities. This design would allow for adequate oral hygiene maintenance. The provisionals were then inserted back and torqued (Figure 7). The patient was recalled multiple times for follow up visits. He was advised soft diet and oral hygiene instructions were strictly reinforced.

After a healing period of three months, the patient was recalled for the final restorations (Figure 8). The provisional prostheses were

removed. Open impression copings were attached to the multiunit abutments. Floss was tied between them and using the floss as a scaffold, all impression copings were splinted together by bis-aryl (Luxatemp, DMG America, LLC, USA) (Figure 9). A special tray was used to obtain the final impression using putty and light body polyvinyl siloxane (Figure 10). A digital scan of the provisional prostheses were obtained to be used as a lab reference. Plaster verification jigs were used to verify implant positions in the master cast (Figure 11). In the next step, occlusal rims were used to record the jaw relation. Trial prostheses were fabricated using PMMA (Figure 12). This also allowed for an esthetic trial. Once this was verified intraorally, the final prostheses were fabricated. A milled titanium substructure was used to support zirconia crowns. On the lower arch, because of the access holes coinciding on the incisal edges, the Palo-Malo design was adopted over select areas (Figure 13).

Following completion of all clinical procedures, a post-operative OPG was taken to verify all prosthetic components radiographically once again, and to act like a baseline for all future radiographic evaluations (Figure 14).

Figure 1: *Pre-operative intra-oral*

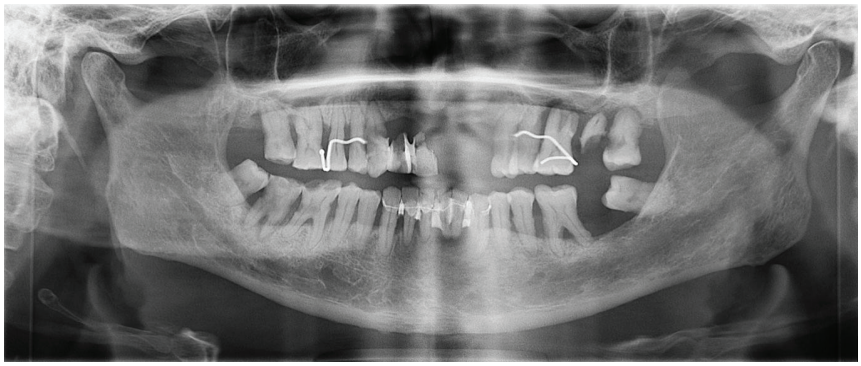

Figure 2: *Pre-operative OPG*

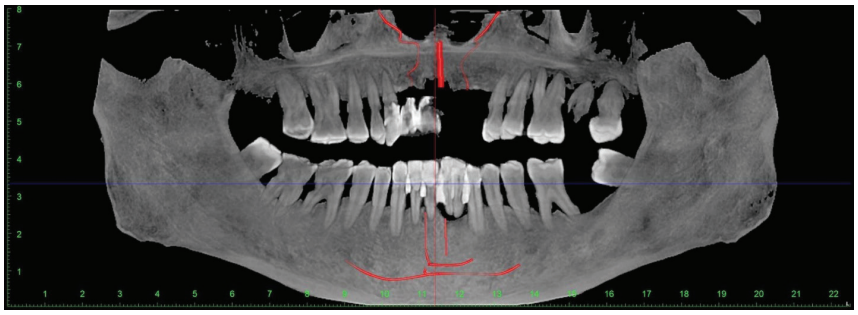

Figure 3: *CBCT for planning*

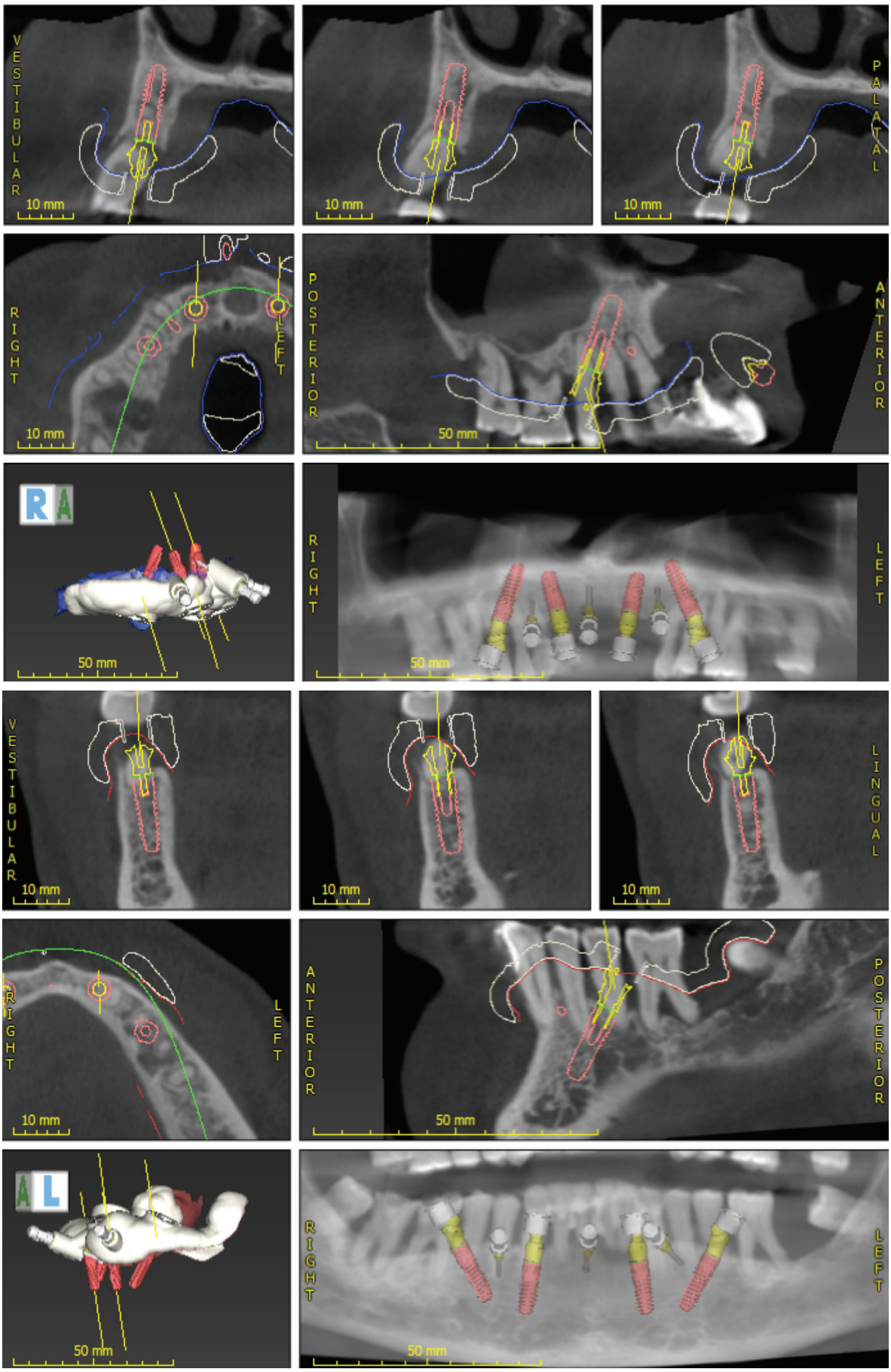

Figure 4: *Digital planning*


Figure 5: *Photodynamic therapy of the extraction sockets*

Figure 6: *Guided implant placement in maxillary arch*

Figure 7: *Provisional prostheses in place*

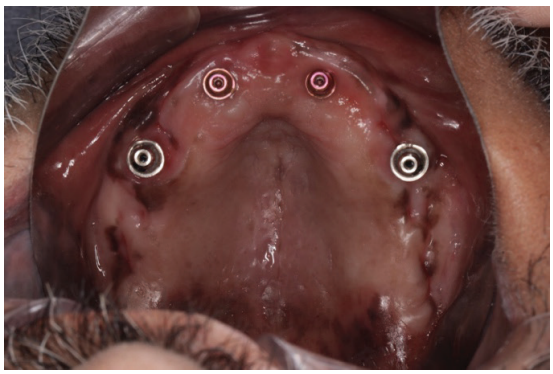
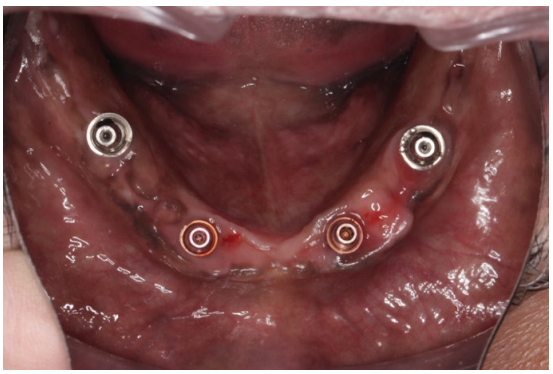

Figure 8: *After three months of healing—upper and lower arch*

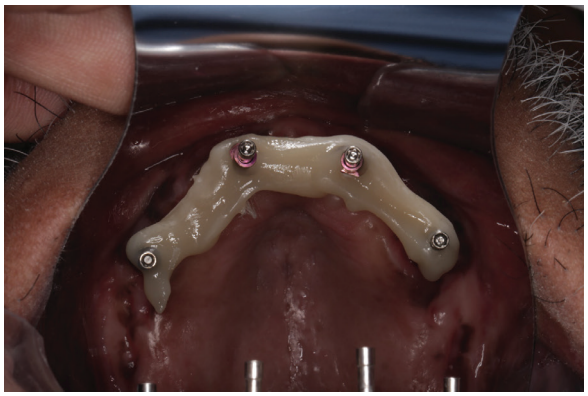

Figure 9: *Impression copings in maxillary arch splinted with bis-acryl*

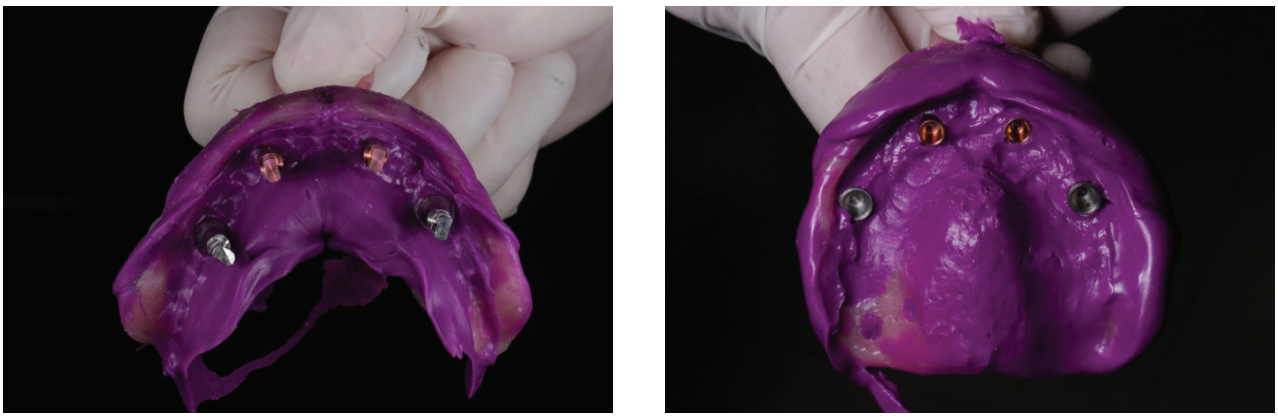

Figure 10: *Final impression*

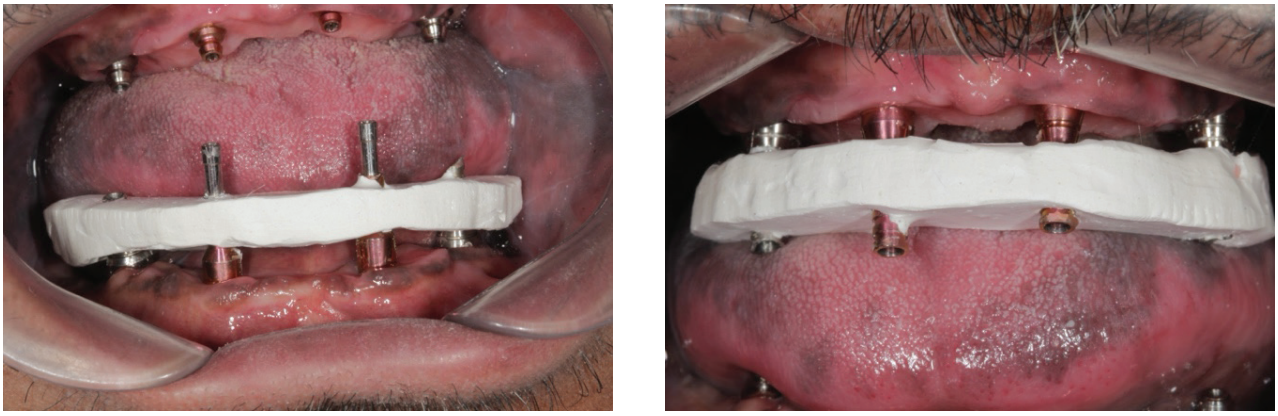

Figure 11: *Plaster verification jig*

Figure 12: *PMMA trial*

Figure 13: *Final restoration and prostheses*

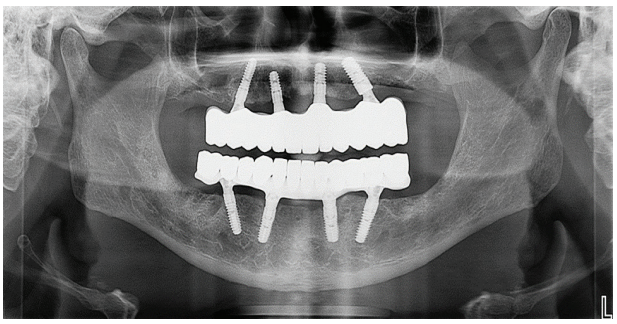

Figure 14: *Post-operative OPG*

DISCUSSION

With implant osseintegration becoming a more predictable procedure, focus is being laid on treatment modalities that allow for immediate function.[11] In addition, patients prefer reliable treatment options that also minimize discomfort and costs. One of the patient's biggest concerns was that he did not want to undergo any period of edentulism wherein he did not have fixed replacements. The patient had undergone an extended period of periodontitis resulting in severe bone loss. Placing implants conventionally would require a extensive hard and soft tissue augmentation followed by a period of healing that would make giving any fixed provisional prostheses difficult. This helps us avoid advanced augmentation procedures keeping the treatment fairly straight-forward. In addition, the placement of only four implants to restore an entire arch minimizes cost to the patient.

The All-on-4 options encompasses all these preferred traits. They have high survival rates.[4] The use of angled multi-unit abutments allows for the placement of implants without the need for additional augmentation procedures. The use of posterior angled abutments have been shown to reduce stress and spread it more distally.[12] Peri-implant bone loss in these angled implants have been seen to be comparable to straight implants placed.[13] The use of multiunit abutments converts bone level implants into essentially tissue level implants. This makes the prosthetic phase easier to execute. Patients who require full arch implants often have a history of chronic periodontitis that results in excessive loss of hard and soft tissues. This often requires that these patients are rehabilitated by FP3 prosthesis. When choosing the kind of prostheses required, an article by Tunkiwala et al classifies edentulous arches into four groups depending on the amount of interarch space available and suggests restorative protocols that may be followed.[14]

CONCLUSION

In conclusion, the All-on-4 protocol offers a simple, and reliable treatment option for the rehabilitation of fully edentulous arches. It avoids the need for any hard and soft tissue augmentations, any period of edentulism, and provides for immediate function which makes it a very favoured treatment modality for patients.

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