

The All-On-Four Treatment Concept: A Case Report

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Abstract: *The severely atrophied maxilla restricts implant placement mainly in the posterior region when using conventional techniques. The “All-on-4” concept could be a good alternative consisting in placing four implants in the anterior part of the fully edentulous jaw to support provisional, fixed and immediately loaded prosthesis. The two most anterior implants are placed axially, and the two posterior implants are placed in an angled position. This approach can be considered a clinically effective treatment with affordable time and cost, allowing a more simple procedure, less morbidity and higher patient quality of life. This clinical case describes the steps to restore an atrophic maxilla following the “all-on-four” concept, with immediate load.*

Keywords: *rehabilitation, edentulous jaw, all-on-four.*

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I. Introduction

The severely atrophied maxilla represents a constant challenge and restricts implant placement in the posterior region when using conventional techniques. This limitation is due to the reduced quantity and quality of available bone, as well as the presence of maxillary sinus pneumatization. Different approaches have been developed to rehabilitate atrophic arches. Among proposed techniques we can count bone graft and maxillary sinus elevation, but these types of interventions are not easily accepted by patients because of their invasive nature, postsurgical morbidity, and high cost [1, 2].

The “All-on-4” concept could be a good alternative consisting in placing four implants in the anterior part of the fully edentulous jaw to support provisional, fixed and immediately loaded prosthesis. The two most anterior implants are placed axially, and the two posterior implants are placed in an angled position [3, 4] to avoid the maxillary sinus, reduce the cantilever length, improve bone anchorage and increase polygonal area for prosthesis support [5,6].

The present clinical report describes a method to restore an atrophic maxilla with the “All-on-Four” technique, using the concept of immediate load.

II. Case report

A 62-year-old man, edentulous for a long period of time due to periodontal disease, reported to the Department of prosthodontics, Farhat Hached Teaching Hospital, Sousse, Tunisia, seeking for a fixed maxillary prosthesis. His past medical history was uneventful (Fig1).

Preliminary impressions were made with alginate in both dental arches. Jaw relation record was obtained. After esthetic try-in, dentures were fabricated and the maxillary prosthesis was duplicated in order to obtain a multi-functional radiological and surgical guide. Panoramic radiograph and cone beam tomography revealed an advanced alveolar bone resorption in the posterior maxilla (Fig2).

Considering the presented situation, the All-on-four concept with immediate loaded prosthesis was suggested to rehabilitate the upper jaw. Although the patient required treatment of his mandibular arch, he chose not to treat both arches simultaneously because of financial constraints.



Figure 1: Preoperative maxillary view.

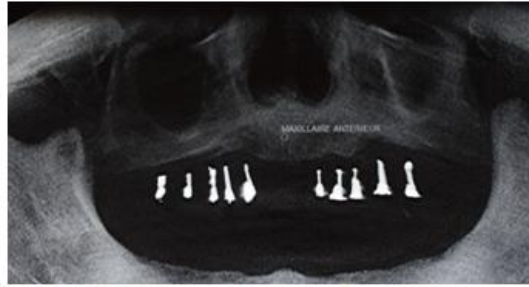


Figure 2: Preoperative Cone beam with radiological guide.

Surgical phase

Surgery was performed under local anaesthesia. A full thickness crestal incision was made along with two releasing incisions in the area of the molars. A high speed diamond round bur with copious external irrigation, was used to identify the anterior wall of the maxillary sinus.

Once the anterior wall of the sinus was located, surgical sequence for implant placement was undertaken. The two most posterior implants (All-on-TRI®) with the diameter of 4.1 mm and the length of 13 mm were placed anterior to the mesial wall of the sinus, tilted distally. Then, two anterior implants with dimension of 3.7 mm diameter and 13 mm length were placed in the anterior maxilla parallel to the midline of the jaw. Surgical guide was used during surgery to facilitate implant placement (Fig3).

Anterior implants are typically emerged at the lateral or central incisor position, posterior implants are placed in the second premolar or first molar region. This arrangement allowed for good implant anchorage, short cantilever length, and large interimplant distance [7].

Following flap suture, straight and angulated abutments were placed into the implants and healing caps were placed to support the periimplant mucosa during the fabrication of the prosthesis (Fig4, 5).



Figure 3: Placement of the maxillary surgical guide.

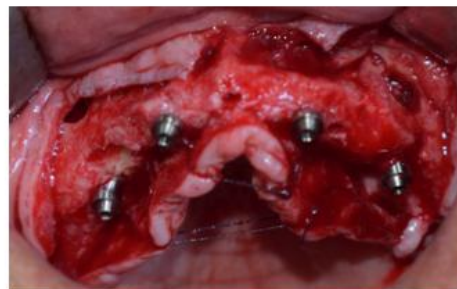


Figure 4: Placement of straight and angulated abutments.



Figure 5: Postoperative panoramic radiograph.

Prosthetic phase

✓ Provisional prosthesis

The polyvinylsiloxane impression of the existing complete denture was made to index the position of the implants (Fig6). Then, these indexed areas were drilled with a round bur to create the access holes. Once the denture was checked for complete seating, cylinders were placed into the multiunit abutments after removal of the healing caps, and screws were tightened over the abutments (Fig7).

In order to prevent the irritation of the soft tissue caused by the monomer and the excess of the resin in the unwanted areas, a sheet of latex was placed in the inner surface of the denture. Afterwards, self curing resin was added around the temporary coping and allowed to set (Fig8). Once the resin sets completely, the denture was unscrewed and finished at the dental laboratory. The provisional prosthesis consisted of 12 units based on the posterior implant position. The cantilever length was no more than 8 mm [8].

Then, occlusion was equilibrated. Anterior occlusal contacts and canine guidance during lateral movements were preferred in the provisional prosthesis. The acrylic resin prosthesis with titanium cylinders was inserted the same day, 2 to 3 hours post-surgically [7] (Fig9).

The patient was scheduled for routine follow up visits after surgery at 1 week, 2 weeks, 4 weeks, and 3 months postoperatively.

✓ Final prosthesis

The definitive prosthesis was fabricated 6 months post-surgically. It consisted of metal-acrylic resin implant-supported fixed prosthesis with Cr-Co framework and acrylic resin prosthetic teeth.

Multiunit impression coping were attached to the multi-unit abutments and splinted with wire-bars and a low shrinkage autopolymerizing resin. The impression was taken with polyether impression material (3M ESPE Impregum soft) using the pick-up technique. Once the impression was taken, multiunit analogs were placed into the impression and the working model was obtained. After trying the screw-retained metal framework on multiunit abutments and evaluating their passive fit (Fig10, 11), they were returned to the laboratory for tooth set-up at the previously established vertical dimension occlusion. The final prosthesis was then fabricated and delivered after adjusting the occlusion. The patient was satisfied with his extraoral and intraoral esthetics, function and phonetics (Fig12, 13). He was scheduled for regular follow-up.

The panoramic radiograph at 1-year-follow up revealed a good bone healing and no sign of periimplant bone loss (Fig14).

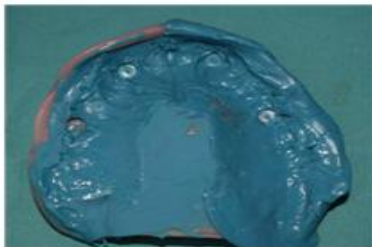


Figure 6: indexing of implant position with elastomeric impression material.

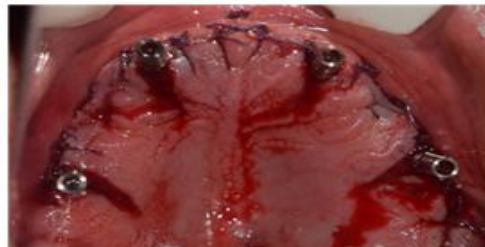


Figure 7: cylinders placed into the multiunit abutments.



Figure 8: self curing resin added around the temporary coping.

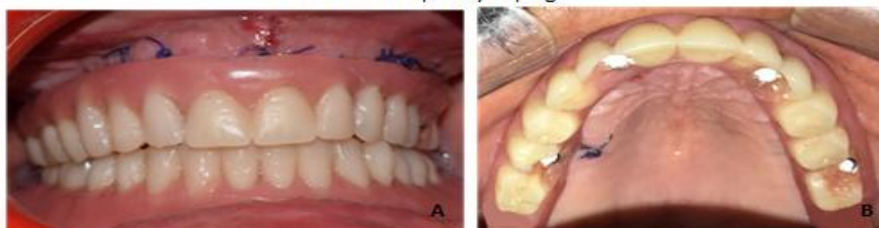


Figure 9: Intraoral views of provisional prosthesis. A: Frontal view, B: Maxillary occlusal view.



Figure 10: Bar fabrication.



Figure 11: Bar try-in.



Figure 12: Intraoral views of definitive prosthesis. A: Frontal view, B: Maxillary occlusal view.



Figure 13: Patient smile with the definitive prosthesis in place.

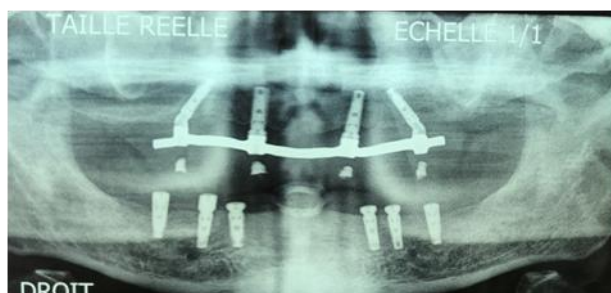


Figure 14: Postoperative radiograph after 1-year-follow-up.

III. Discussion

The challenge today is not to prove functionality but, rather, to develop simple, reproducible and cost-effective protocols [3]. The all-on-four concept has been proven to be clinically effective treatment for completely edentulous jaw with affordable time and cost through immediate rehabilitation, by providing relatively straightforward and predictable treatment, thereby ensuring a high outcome of quality of life [9, 10].

The use of angulated implant in the maxilla has been demonstrated to be an alternative to bone grafting [7, 6]. By tilting the distal implant, the cantilever extension decreases and the length of the prosthesis supported polygon increases achieving a better load distribution [11, 12]. In addition, the tilting may also provide good cortical anchorage and improve primary stability allowing the use of longer implants [6].

A distal position of the posterior implant, reducing the cantilever length, achieves a more favorable stress distribution in the bone. Bevilacqua et al. demonstrated that tilting of the distal implant decreased the level of stress bone, when compared to axial implants supporting a higher number of cantilevered teeth [13].

Furthermore, implant tilting does not induce any biological disadvantage. Strain gauge measurements performed by Krekmanov showed no significant differences in forces and bending moment between tilted and non tilted implants. From a biomechanics point of view, the position of the coronal end of the implant is more important than its inclination, whether the implant is tilted or not [6].

Immediate loading of implant supported full-arch prostheses is considered a predictable technique [14]. Maló et al., in a 1-year retrospective study, reported a high survival rate of 97,6% [4].

The immediate loading procedure improved patient acceptance of implant treatment [8]. It has shown a high level of satisfaction for patients in terms of esthetics, phonetics, and functionality [14]. According to Callandriello R et al., the use of tilted implants and immediate load decreases treatment time, reduces surgical invasion and represents a lower cost [15]. In particular, it may avoid months of complete edentulism or the wearing of an uncomfortable denture. These factors benefit the patient as well as the clinician [8, 16].

To accomplish immediate function, all-acrylic prosthesis is usually placed within a few hours after surgery [7]. However, the most frequent prosthetic complication is the acrylic provisional prosthesis fracture, which usually occurs close to the coping, a relatively weak region [9, 8]. Maló et al., observed acrylic fracture as 27% [3]. Strengthening prosthesis with metal wire and compliance with the soft diet is suggested to prevent them [8]. Furthermore, tooth fractures in definitive acrylic resin prostheses are a frequent complication, especially when the opposing teeth are natural, and they seem to have a higher incidence comparing to cases with full denture or implant-supported overdenture, because of the application of greater forces [9].

IV. Conclusion

The all-on-four concept can be an alternative treatment option especially in atrophic edentulous jaws. It represents a less invasive and financially competitive treatment, with reduced time procedure and a higher patient quality of life.

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