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Case Report

All on Four Concept and Immediate Loading for Atrophic Maxilla Rehabilitation: Case Report

Dr. Fnaiech Achraf[1*], Dr. Bedhief Rabeb[2], Dr. Masmoudi Karim[3], Dr. Jaouadi Jamila[4]

[1]Assistant Professor, removable prosthodontics, Faculty of Dentistry Monastir, Tunisia
[2]Resident in removable prosthodontics, Faculty of Dentistry Monastir, Tunisia
[3]Professor in removable prosthodontics, Faculty of Dentistry Monastir, Tunisia
[4]Professor in removable prosthodontics and head of the department, Faculty of Dentistry Monastir, Tunisia

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Abstract: All on four concept is an efficient technique to treat completly edentulous patient with high ridge resorption. using tilted distal implants we can reduce the lenght of posterior cantilever and avoid complex surgical procedures. Survival rate with this technique reach the 99.8% for the first 5 years (5).

Keywords: Implant, immediate loading, denture, implant prostheses, all on four concept.

INTRODUCTION

Modern implantology has revolutionized the treatment of patient suffering from complete edentulism. Dealing with such patients The gold standard was to place 6 to 8 implants in the maxillary jaw and 6 implants in the mandibular jaw. These implants will then support a full arch bridge which will replace all the teeth. In some cases when a patient presents with highly resorbed ridge in the maxilla. Placement of such a number of implants will be more complicated. It will need sinus lifting procedure and bone grafting. This type of surgery has limitations, including multiple surgical procedures, patient morbidity, a higher risk of complications, longer treatment period, higher costs, and low patient acceptability. To solve this problem, many practitioners use to make long cantilevered prostheses. In the presence of a cantilever, implant overstress can be observed, which increases the implant failure risk and biomechanical complications.

The all-on-four concept was introduced by Dr. Paolo Malo to address these problems. This protocol use to place only four implants in the anterior part of the edentulous jaw with two straight anterior implants and two tilted distal implants. This technique offers a predictable way to treat the atrophic jaw in patients that do not prefer regenerative procedures, which increases morbidity and the treatment fees.

This article aims to report a case of full maxillary arch rehabilitation using all on-four-concept and immediately loaded implants with guided bone regeneration.

CASE REPORT

A 62year-old male was referred to the Clinic of Dental Medicine of Monastir for prosthetic rehabilitation. The medical history did not reveal any systemic diseases. Intraoral examination revealed a complete edentulous maxillary arch with a thick adherent mucosa. The crest is medium in height and width (fig 1).

He also has a complete edentulous mandible with a highly resorbed crest covered by thin fibro mucosa (fig 2).

The patient has a complete removable prosthesis in the maxilla and a complete removable mandibular prosthesis stabilized by two implants with O ring attachments (fig 3).

***Corresponding Author:** Dr. Fnaiech Achraf

Fig-1: Upper jaw

Fig-2: Lower arch with two parasymphyseal implants

Fig-3: Maxillar complete removable prosthesis and Implant-stabilized complete mandibular denture

The chief complaint was the lack of retention of the complete maxillary prosthesis. The CBCT (Cone-beam computerized tomography) was performed to better evaluate the case by showing the bone quality and quantity.

The radiological examination revealed advanced alveolar bone resorption, particularly in the maxillary posterior region. However, in the maxillary anterior region, the bone length was sufficient but the width was reduced with a buccal concavity (fig 4).

The patient asked to rehabilitate the upper jaw with a fixed implant-supported prosthesis. All on-four concept was scheduled to rehabilitate the maxillary jaws. Indeed, It is based on the placement of four implants in the anterior part of fully edentulous jaws to support a provisional, fixed, and immediately loaded full-arch prosthesis. Combining two tilted and two straight implants [5]. A tapered intra hex Intra Lock™ implant was used.

The posterior implants are fitted titled at an angle of 30 degrees, with a diameter of 4mm and length of 11.5mm. Whereas, the anterior implant was straight, with a diameter of 4mm and length of 11,5mm. Fig 2: Mandibular arch

Fig-4: The radiological examination: CBCT

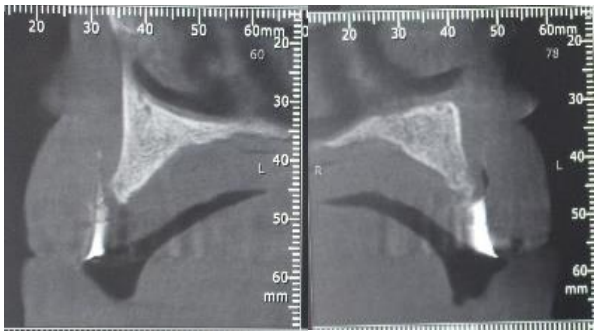

Fig-4a: Anterior residual bone

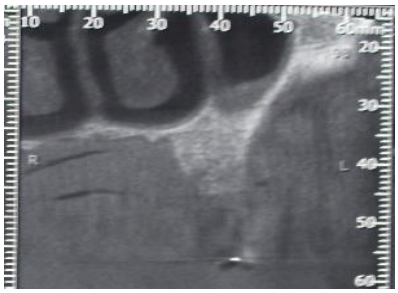

Fig-4b: Posterior residual bone

Clinical Procedure

Surgical phase

Antimicrobial treatment was administered with amoxicillin Clavulanate for 7 days, beginning 2 days before the surgery. We started with an initial rinse using Chlorhexidine digluconate 0.2% for two minutes to disinfect the mouth, and then local anesthesia was performed.

A Crestal incision from the right first molar to the controlateral is made with distal discharge. Then Full-thickness flap was released (fig 5). The ridge crest

was trimmed to enlarge it and to remove any sharp edges (fig 6).

Parallel pins into nasopalatal foramen in order to guide the drilling (fig 7). All sites were prepared using the manufacturer's guidelines (Intra Lock™) under copious saline irrigation. The two anterior implants were inserted in an axial position parallel to the pins axis inserted in the palatal foramina (fig 8).

To assist the insertion and positioning of the posterior implants a geo-triangle was used. The implant's position was located between the anterior wall of the maxillary sinus, reaching an angulation of 30° with the occlusal plane.

The posterior implants emerged typically at the first molar position benefiting from the distal tilting along the anterior sinus wall (Fig 9). We start by confirming implant torque to greater than 35N.

Multi-unit abutments were connected to the implants: 30° angulated abutments connected to the two posterior tilted implants and straight connected to the anterior implants with a torque of 15N (Fig 10).

After placement of the healing cap (fig 11), a guided bone regeneration was performed on the antérior implants (fig 12). The flap was closed and sutured. A panoramic radiograph was obtained immediately after implant surgery (fig13).

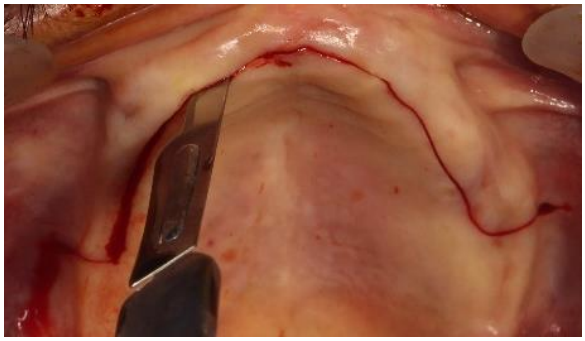

Fig-5: Full-thickness flap elevation

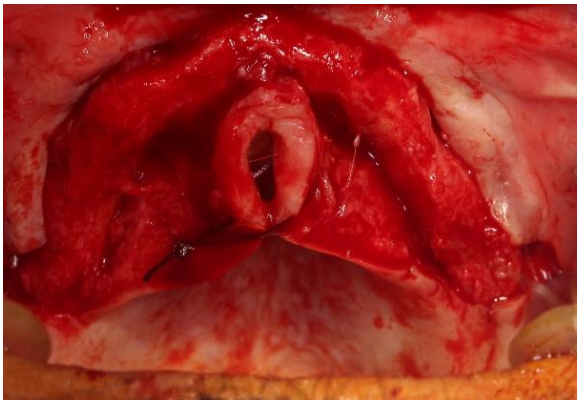

Fig-6: Alveolar ridge regularization

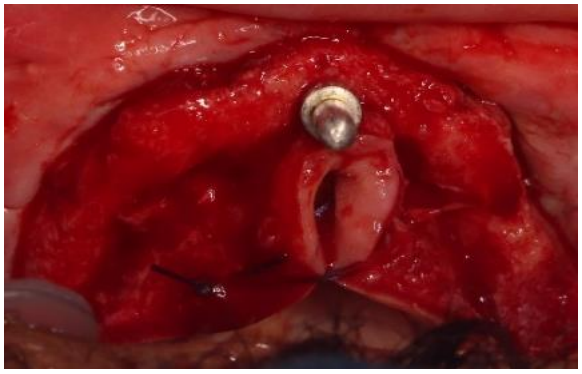

Fig-7: Parallel pins into nasopalatal foramina

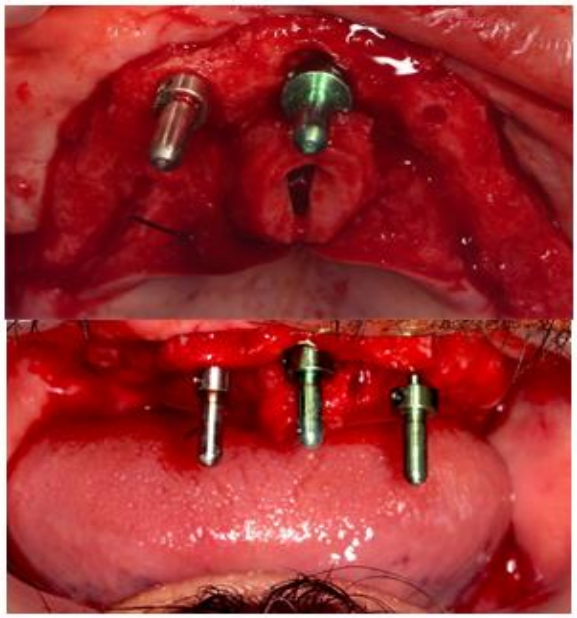

Fig-8: Implant drilling guided by parallel pins axis

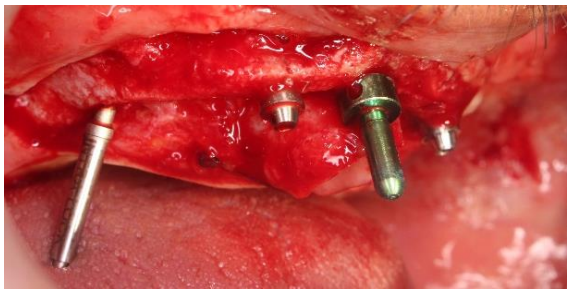

Fig-9: Posterior implant angulation

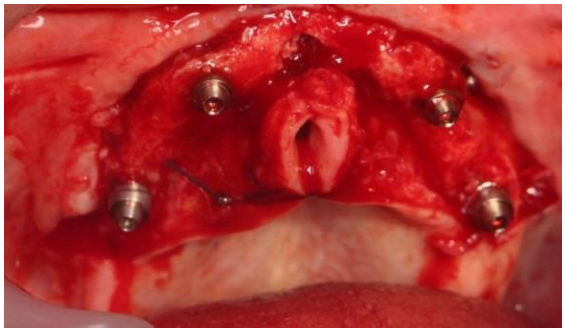

Fig-10: Distal abutement with 30° inclination to compensate the lack of parallelism between implant

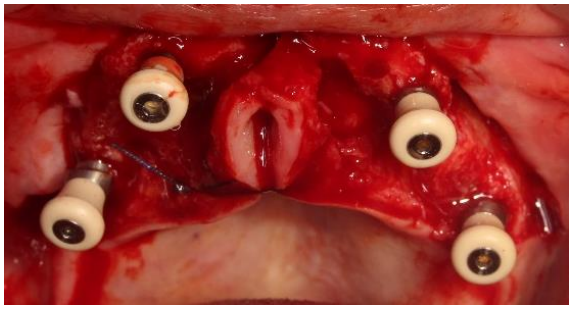

Fig-11: Placement of protective Healing cap

Fig-12: Guided bone regeneration

Fig-13: Post surgery Panoramic radiograph

Prosthetic phase

After 24 h (fig14), A polyvinyl siloxane impression with the complete removable prosthesis was made to detect the position of implants (the healing screws) (fig15). Then the prosthesis was perforated in front of the implant position (fig16). The temporary abutments were attached over multi-unit abutments (fig17).

We checked the adaptation of the prosthesis's perforation. If there are interferences with the temporary abutment, the orifices are enlarged to create enough space to ensure the perfect sitting of the prosthesis on the supporting tissues. Thereafter, a rubber dam was placed over the temporary abutment to protect the mucosa (fig18). Then, low shrinkage auto polymerizing resin is added to fix those abutments to the prosthesis (fig 18).

We Send the prosthesis to the laboratory, to remove resin excesses, to reduce excess temporary abutment, and to polish the prosthesis (fig 19, fig 20).

In order to avoid fracture, à 0.9 round wire is added to the prosthesis in the lab to augment rigidity (fig 21).

Finally, the Provisional prosthesis is taken to the mouth and screwed at a torque of 15 Ncm. Thereafter, the access hole was sealed with fluid resin.

The occlusion is evaluated and corrected so that contacts are evenly distributed across the full-arch prosthesis and that there are no premature contacts or interferences.

After the placement of the provisional prosthesis, the patient is recommended to maintain a soft diet for 2 months and oral hygiene with the aid of irrigators.

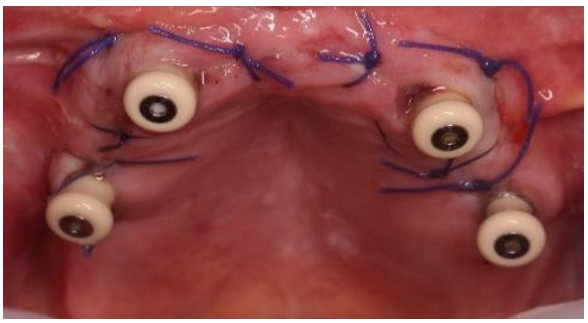

Fig-14: Surgery site after 24 h

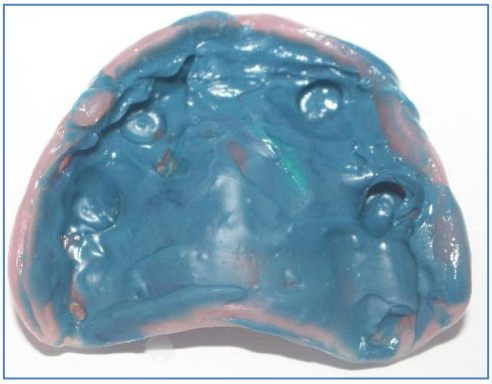

Fig-15: Index the denture with silicone to locate the healing abutments

Fig-16: Create adequate space in the denture where index markings are present

Fig-17: Removal of healing cap and placement of multi-unit temporary copings

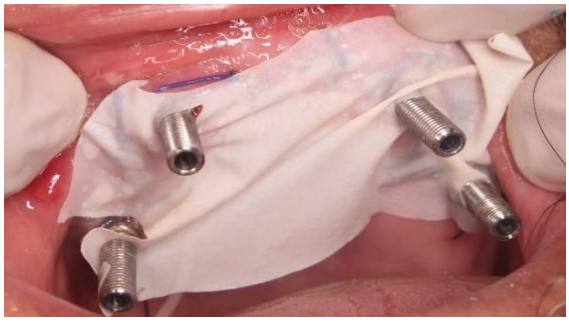

Fig-18: Placement of a rubber dam over temporary copings to protect the surgical area

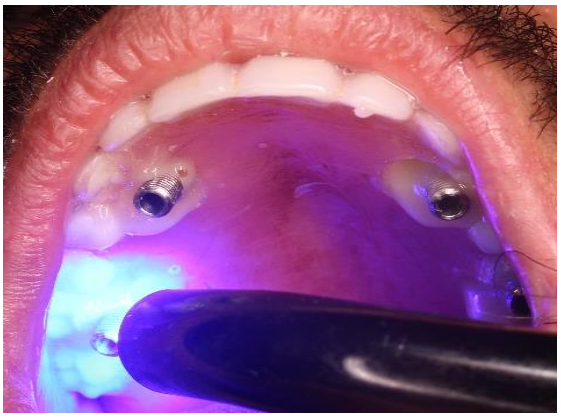

Fig-18: Acrylic Resin is introduced in the rest of the perforations to splint the abutement to the denture

Fig-19: Filling the voids with resin between temporary abutments and the prosthesis with anolog abutments in place

Fig-20: A and b: Reduce excess temporary coping with denture level

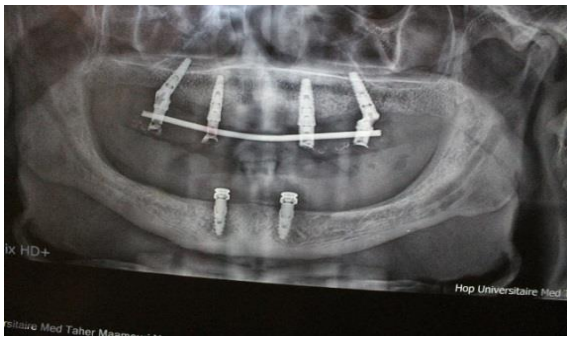

Fig-21: Panoramic radiograph with prosthesis in the mouth

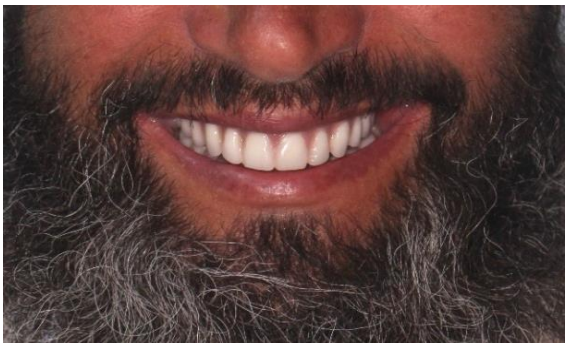

Fig-22: Final result

DISCUSSION

The main indication of All-On-4 standard care is an atrophic maxilla or mandible with or without remnant hopeless tooth in ASA I or II patients. This surgical-prosthetic protocol seems efficient, safe, and effective in Cawood & Howell class IV, V, and VI [7].

The procedure requires minimum dimensions of the alveolar process (minimum of 12 mm of height) in the maxilla between the mesial wall of the maxillary sinuses (pre-maxilla) or between the emergence of the mental nerves in the mandible, to allow placement of the four implants.

Another indication refers to patients reluctant to undergo bone regenerative procedures such as sinus lift, bone grafting, or transposition of the dental nerve which increase morbidity and treatment fees [11].

The surgical difficulties in the all-on-four protocol are how to locate the anterior wall of the maxillary sinus to place, safely, the tilted implants. In effect, some authors used to make a small window to visualize the anterior wall of the maxillary sinus. This window technique allows adequate implant insertion, and in the jaw to denudate the emergence of the mental foramina [11]. Others deem that the safest way is guided surgery using à computed surgical guide which will be planned before the procedure according to patient anatomy (CBCT and intraoral scanning).

Another strain, is how to obtain enough primary implant stability for immediate loading especially in maxillary arch with poor bone quality. In fact, this primary stabilitity depends directly to the insertion torque.

Besides, the insertion torque is defined as the rotational resistance at the time of implant placement. Many authors admit that high insertion torque leads to better thread engagement to the bone. Though, different studies have suggested that insertion torque does not necessarily relate to primary stability. Furthermore, high levels of insertion torque might exceed the elastic limit of the bone causing compression necrosis and increasing the risk for marginal bone remodeling [4]. This point is in agreement with the findings of Malo's study (2018) who conclude that implants with insertion torques of <30 N.cm may render comparable success rates and marginal bone loss at 1 year compared to implants inserted with insertion torques of 30 N.cm [4].

Moreover, in an attempt to enhance the insertion torque, we used a tapered implant and we performed an Under-preparation of the implant bed to obtain better primary stability, avoiding countersink in cortical bone. Similarly, Malo *et al*. described the protocol for the insertion of implants following standard procedures, except that under-preparation was used to achieve an insertion torque of at least 35 Ncm before final seating of the implant [5].

Thinking about the all-on-four protocol many questions came to our mind : Is this technique more predictable than all-on-six protocol ? Can only four implants support a full arch prosthesis? For how long it will resist to occlusal load? What are the mechanical complications that can be faced?

According to Cláudia Lopes's study (2016), the all-on-six treatment concept showed the most favorable biomechanical behavior and can be considered a viable alternative for moderate atrophic maxilla rehabilitation [3].

Indeed, The hypothesis, which proposed that short implants in the posterior maxillary (all-on-Six concept) would result in lower stress to the implants and bone tissue than would long, angled implants (all-on-four-concept), was partially accepted.

In the other hand, the All-on-Six treatment showed lower stress on the implants, cortical and trabecular bone [3]. The presence of a greater number of implants in the All-on-six concept allows better transmission of force to the implants and supporting tissues [2].

Furthermore, the stress reduction caused by the addition of implants in the posterior region was in accordance with an in vivo study. Whereas, The stress values did not exceed the bone resistance limits for both treatment concepts [3].

Though, as reported by Rangert and coll's study (1989), when six or four implants are spread out over the same arch length, there is no significant benefit in selecting six rather than four from a biomechanical point of view, because, in this situation, the anterior and the posterior implants receive the forces with little to no contribution of the intermediate implants [2].

In addition, in case of using four implants, depending on the positioning of the posterior implant and the degree of jaw atrophy, the presence of a cantilever may be inevitable which increases the risk of mechanical complications in the prostheses. Thus, the presence of bone volume in the posterior jaw that allows the insertion of more implants (six implants) is beneficial to improve prosthetic support and to decrease cantilever length [3].

Some authors focuced on complications of all on 4 concept and reported that The most frequent mechanical complication was acrylic prostheses fracture, as well as screw losses [11]. Indeed, a high incidence of fractures has been described, in cases with full arch implant supported prostheses in both arches, which could be due to reduced proprioception [16].

However, these complications can be avoided with mechanical maintenance such as good occlusion adjustment, nightguard use, and advising the patient to not eat that overload the prostheses.

On the other hand, the main biological complications, such as peri-implantitis, are poorly described in the available literature.

CONCLUSION

Edentulous patients can have a predictable result with all on four treatment concept especially those who are suffering from highly ridge resorption and are afraid of complex surgical procedure. According to Malo P and all's study (5), we can have a 99.8% survival rate after five years of follow-up. But more evidence is needed, especially, clinical studies

with more than 15 years of follow-up to have a clear protocol with high survival rates.

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