Full Arch Implant Rehabilitation Using All-On-Four Technique – A Case Report

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Abstract:

The concept of "All-on-Four" is based on placing four conventional implants in the anterior part of fully edentulous jaws to support a provisional, fixed, and immediately loaded full-arch prosthesis. The technique stabilizes bone levels, keeping the jaws healthy. The Combination of tilted and straight implants for supporting fixed prostheses can be considered a viable treatment modality resulting in a simpler and less time consuming procedure, significantly less morbidity, decreased financial costs and a more comfortable postsurgical period for the patients. The technique also stabilizes bone levels, keeping the jaws healthy.

Keywords: *dental implant, All-on-four, full arch, missing teeth, prostheses*

Introduction:

Dental implants are widely used and are considered to be one of several treatment options that can be used to replace missing teeth [**1-3].** Severe atrophy of the alveolar ridge often develops following tooth loss, with increasing severity over time in the edentulous jaw. An extensive surgical bone augmentation procedure is often necessary to achieve sufficient bone support to place standard implants (10–12 mm length, ~3.5 mm diameter) in the posterior severely atrophic jaw. [**4**]The size of the residual ridge reduces rapidly in the first six months, however bone resorption activity

continues throughout the life. There exists variety of sizes and shapes of residual ridges and are categorized into commonly residual ridge configuration into six orders by Atwood [**5**].

Atwood's Ridge Classification:

Class I : Dentate/Pre-extraction

Class II : Immediately after extraction

Class III : Well rounded ridge with adequate height and width

Class IV : Knife-edged ridge, adequate in height but inadequate in width

Class V : Flat ridge form, inadequate in height and width

Class VI : Depressed ridge form with some basilar loss evident

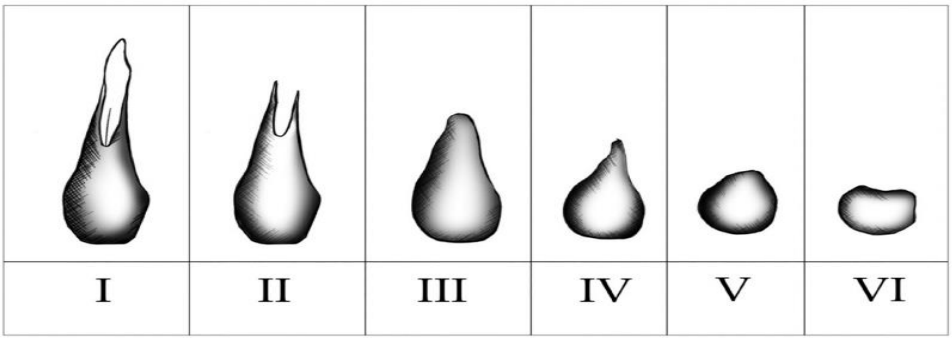

Figure 1: Atwood's Ridge Classification

Over the decades, removable dentures and multiple implants supported overdentures were in use for full mouth reconstruction. Solutions to inadequate ridge height include the use of short implants, vertical ridge augmentation procedures, or cantilever prostheses. Among various other options in replacing fully edentulous patients, Conventional removable dentures and bone grafting with multiple implants was noted to have several limitations where latter has shown to take several years for the treatment procedure and has higher costs. Moreover, a number of studies have shown that wearing conventional removable dentures reduce quality of life causing pain and discomfort, chewing and speaking difficulties, reduced occlusal force and poor oral sensation. Augmentation surgery, regardless of reconstructive procedure, carriers a higher risk of patient morbidity and complications (e.g., infection, loss of graft material) as well as higher costs and longer time intervals to complete the treatment.

The full-arch implant rehabilitation offers edentulous patients the opportunity to have a full-arch fixed restoration even if their bone levels are insufficient and of very poor quality

- Use of tilted posterior implants to overcome bony deficits or avoid vital anatomical structures
- Four to six dental implants to support a full-arch fixed prosthesis
- Single-day treatment for extractions, implant placement, and possible provisionalization with a fixed prosthesis [**6**]

The "all-on-four" treatment concept was developed to maximize the use of available remnant bone in atrophic jaws, allowing immediate function and avoiding regenerative procedures that increase the treatment costs and patient morbidity, as well as the complications inherent to these procedures. An optimal number of four Implants was previously reported in literature with 10 years results [**7**].

In All-on-4 concept, the two most anterior implants are placed axially, whereas the two posterior implants are placed distally and angled to minimize the cantilever length, and to allow the application of prostheses with up to 12 teeth, thereby enhancing masticatory efficiency [**8-9**]. Combination of tilted and straight implants in supporting fixed prosthesis was considered to be a feasible treatment option resulting in simpler, cost-effective and more comfortable with decreased morbidity for the patients. [**10**]

Case Report: A 54 y/o male patient, systematically healthy, partially edentulous for a long period of time due to periodontal disease was referred to the Dept. of Periodontics with Chief Complaint of loosened teeth. Upon Clinical and radiographical examination using orthopantomogram revealed advance bone loss in the posterior regions of maxilla and mandible. CBCT scan also revealed presence of Mandibular canal near to the top of the residual crest. Various treatment options were discussed with the patient including Complete Dentures and Implant supported prosthesis. Patient has opted for Full Arch Implant rehabilitation using All-on-Four technique. Informed consent was obtained from the patient.

Figure 2: Preoperative Clinical Picture

Under Local anesthesia all the four mobile teeth were extracted and implant site preparation was performed. Flapless approach was administered at healed sites for the placement of implants. The 2 mm osteotomy site was made in midline position and two anterior implants were placed at lateral incisive area where there is enough availability of bone. Posterior implants are placed at angulation to support full prosthesis, minimum of 24 teeth (Molar to Molar) avoiding mental foramina in case of mandible. Post-operative history was uneventful.

Figure 3: Preoperative Orthopantomogram

After soft tissue management, straight and angulated abutments were placed on to implants, and impressions were taken using heavy and light body putty. Using the help of a prosthodontist, a verification jig trial was done to ensure accuracy of the impressions. Jaw relation, facebow recording and bite registration were done in the conventional manner. Wax try in was carried to ensure esthetics, function and patient acceptance. Try in of the titanium framework was done, occlusion was adjusted to implant protected occlusion.

Prosthetic screws were fixed and metal resin hybrid prosthesis was delivered to the patient. Patient satisfaction on aesthetics and function were recorded and followed up for over one year. Patient has given satisfied results over the period of one year in terms of function, aesthetics and perioral considerations.

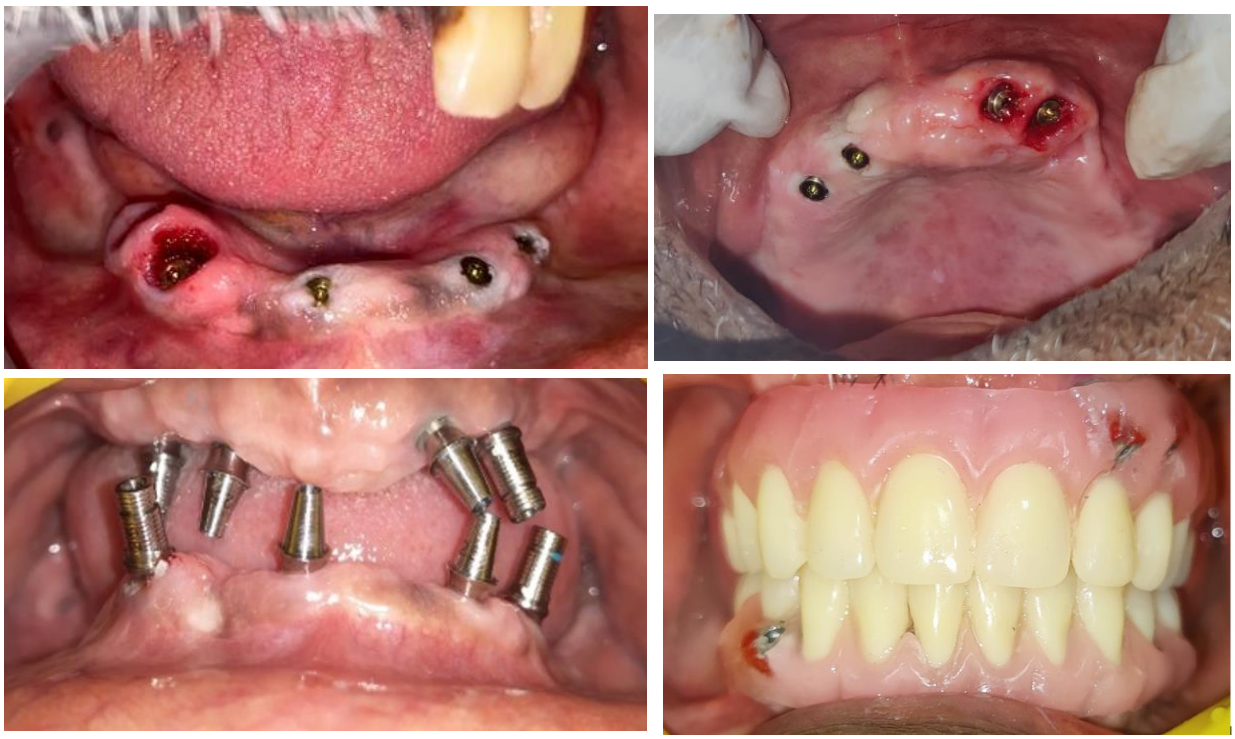

Figure 4: Clockwise – Implants Placed in Mandible, Implants placed in Maxilla, Abutments Connnected, Final Prosthes.

Discussion:

Implant supported restorations have been a challenge in atrophic jaws because of small quantity and low quality of bone, proximity to nasal cavities, maxillary sinus or inferior alveolar nerve. The all-on-four treatment concept arises as an attempt to allow treatment with affordable time and cost through immediate implant-supported restorations, providing relatively straightforward and predictable treatment in edentulous patients with atrophic jaws. The "All-on-Four" procedure also improves cortical anchorage and primary stability, allowing the use of longer implants. In a three-dimensional finite element analysis about load transmission using different implant inclinations and cantilever lengths, Bevilacqua et al. reported a reduction of stress around anterior implants in a full fixed prosthesis design, when tilted implants were compared to straight implants. [**11-12**]

The placement of the two posterior implants in front of mental foramina and tilted with a distal direction avoids to injure the inferior alveolar nerve and decreases the cantilevers, allowing the increase of the polygonal area for a full fixed prosthesis and providing satisfactory molar support [**13**]. Tilting the implants at placement involves a number of factors, including bone availability and the increased amount of cantilever obtainable via angulation. [**14]** Furthermore there are no significant differences between axial and tilted implants in terms of success rates and marginal bone loss [**15**]. Biomechanical analyses indicate that the most anterior and posterior implants supporting a reconstruction take the major load share at cantilever loading, irresepective of the number of implants.

Soft and hard tissue healing around the implant achieves marginal soft tissue attachment and osseointegration respectively. Soft tissue adaptation plays key role in establishing a physical seal between oral environment and bone-surrounded implant, which in turn is expected to prevent microbial organisms and contaminated products from oral cavity reaching underlying bone. Also, a stable peri-implant soft tissue attachment, in presence of bone support has critical impact on long-term esthetic outcomes of implant therapy and also plays important role in achieving and maintaining desired soft tissue contour around Dental Implants [**16].** On the other hand, structural and functional connection between living recipient bone and titatnium dioxide on implant surfaces provides mechanical stability for implants which allows for functional loading of implant supported prosthesis.

Nevertheless, there are certain limitations to consider before implementing the technique such as anatomically insufficient bone volume, insufficient mouth opening, fracture of prosthesis or extending the cantilever beyond the limit which will contradict in performing the technique [**17-18**]. However, early placement of implants within eight weeks after extractions seems to provide as high of a success rate as immediate placement and delayed placement (usually 2-3 months or more after extractions) of implants. Proper diagnosis and precise treatment planning are key to success for implant rehabilitation. Implant-supported FPD is a viable treatment option in the literature and has shown predictable long-term outcome

Conclusion:

The “All-on-4” treatment concept seems to be an alternative option for rehabilitating edentulous jaws compared with advanced surgical approaches without using removable prostheses. It is a cost-effective procedure, decreasing the treatment times, the morbidity and allowing a higher patient quality of life.

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