

THE “ALL-ON-4” IMMEDIATE FUNCTION CONCEPT: A Review

Shivani Bhardwaj *, Rajeev Srivastava ***, Umesh Palekar **, Vivek Choukse ***,

Abstract:

The rehabilitation of the edentulous arches with endosseous implants in the posterior region of jaw is often associated with anatomic complications such as jaw shape and location of the mental loop, mandibular canal in mandible and maxillary sinus in the maxilla. The All-on-four concept advocates immediate loading and the placement of distal implants at an angle. The purpose of this concept is to modify the implant placement protocol in the posterior part of the jaws to extend fixed implant connected prosthesis further distally, and to reduce the length of the cantilevers in full arch prosthesis without any transpositioning of mandibular nerve or performing bone grafting in maxilla.

Key words : Implant, Edentulous ridge, All-on-4

Introduction

Edentulism can be a result of poor oral hygiene and dental disease; equally however, there are patients that have heavily restored failing dentitions that have become non-restorable. When a patient loses all of their teeth, they are essentially relegated to living the life of a “dental cripple”. Chewing efficiency is lost, their level of comfort declines and often they appear to age prematurely¹. Common complaints with conventional dentures are pain, instability, gagging, lack of retention, diminished oral sensory function and minimal masticatory efficiency. In combination, these complaints impair function as well as lower self-esteem^{2,3}.

The use of complete denture placed in immediate function represents a valid treatment option for completely edentulous patients, allowing for the placement of the implant and the prosthesis during the same procedure and with high survival rates in

both the maxilla (93-99.2% with 1-5 yr of follow up) & mandible (93.2-100%-with 1-5 yr of follow up). One of these protocol is the All-on-4 concept (Nobel Biocare AB, Goteborg, Sweden), with which, through the placement of 4 implants, it is possible to rehabilitate the completely edentulous jaw with minimum bone volume & avoiding, in most situations, bone augmentation procedure. Provided the implants are placed strategically, 2 posteriorly and 2 anteriorly, and they are well anchored, the probability of good outcome is high (97.6% - maxilla, 96.7-98.2% - mandible for 1 yr follow up)^{1,4,6}.

TREATMENT CONCEPT

Developed by Paulo Malo and encompasses an immediately loaded full arch fixed prosthesis anchored with four implants in either the maxilla or mandible. Utilising immediate function full arch prostheses in the maxilla and mandible has been documented as a predictable and successful procedure based on long-term results. After teeth have been removed in the completely edentulous jaw, there is often significant bone loss due to resorption, minimal bone volume, poorer

* Post-Graduate Student, ** Professor & Head, ***Professor, Dept of Prosthodontics, Modern Dental College & Research Centre, Indore.

bone quality and the need for bone grafting to be carried out prior to implants(Fig:1).



Fig :1

In the completely edentulous jaw, there is often insufficient vertical height after bony resorption in the posterior regions. This may occur due to bone resorption after teeth removal.

ADVANTAGES OF THE ALL-ON-4 CONCEPT

- Angled posterior implants avoid anatomical structures
- Angled posterior implants allow longer implants anchored in better quality bone hence high success rates
- Reduces posterior cantilever
- Eliminates bone grafts in the edentulous maxilla and mandible in majority of cases
- Implants well-spaced, good biomechanics, easier to clean
- Final restoration can be fixed or removable. Immediate function and aesthetics
- Reduced cost due to less number of implants and avoidance of grafting in the majority of cases¹

CONTRAINDICATIONS

- Insufficient bone volume, Irregular or thin bone crest²
- Remaining teeth that interfere with the planning for implant placement

- In patients with insufficient mouth opening it is difficult to accommodate surgical instrumentation of at least 50mm

DIFFICULTIES ENCOUNTERED WITH THE ALL-ON-FOUR CONCEPT

Detection of anterior sinus wall requires additional surgical skills. Tilting implants is limited by the ability of the patient to maintain maximal opening during placement. In mandible the procedure of placing tilted implants is further complicated by the assessment of the mesial nerve loop extensions. This can be done with the help of;

*Computerized tomography

*Clinical intraforaminal probe insertion².

The All-on-4 technique involves tilting the posterior implants, allowing the clinician to avoid anatomical structures. It also enables the placement of longer implants into better quality bone anteriorly.

When used in the mandible, tilting of the posterior implants makes it possible to achieve good bone anchorage without interfering with the mental foramina. In severely resorbed maxillae, the tilted implants are an alternative to sinus floor augmentation⁵.

The tilted distal implants results in a better spread of the implants along the alveolar crest which is beneficial for the load distribution and allows the final prostheses to hold as many as 12 teeth with only short cantilevers.

INCLUSION CRITERIA

All-on-four concept can be considered as a treatment option for the patients who meet the following criteria:

Good general health and acceptable oral hygiene;

Sufficient bone for 4 implants of at least 10mm in length; and

Implants attain sufficient stability for immediate function¹.

EXAMINATION

Extra-oral examination

Smile line: high or low smile line reveals the transition zone

Lip support and length: patients should be assessed to see if they require a flange for lip support.

Vertical dimension of occlusion

Intraoral Examination

Thickness of mucosa and keratinization of tissues

Interarch relationship and space

Incisal edge position

Signs of parafunction or dental disease

Radiographic examination

Cone beam computed tomographic scan

DISCUSSION

The All-on-4 concept is a highly successful treatment option for the edentulous patient with excellent clinical outcomes. This is achieved without major grafting and its associated costs and surgical morbidity

The reduced number of implants and component also enables a reduction of cost compared to traditional implant reconstructions. The All-on-4 concept is a paradigm shift in how implants are placed and angulated compared to traditional concepts with axial placement in a vertical manner.

The angulations allow placement that avoids anatomical structures and also allows the use of longer implants, enabling

increased bone to implant contact and placement of the implant into better quality bone anteriorly¹.

Late implant failures are not common so if there has been an early failure the provisional prosthesis can be modified and the implant can be replaced and utilized within the same prosthesis and then the final prosthesis can be constructed once integration has been verified. The long term results of this technique and numerous advantages of immediate loading, the reduced morbidity, the high patient satisfaction and the relatively low costs should be taken into account when a decision among the alternative treatment options for an edentulous jaw has to be made^{1,2}.

Antonios Zampelis (2007)⁸ evaluated the tilting of splinted implants, whether it affects stress distribution in the bone surrounding the implant cervix, and also investigated that the use of tilted implants as distal abutments is biomechanically superior to the use of distal cantilevers, autor found that distal tilting of implants splinted by fixed restorations does not increase any bone stress compared to those of normally placed, vertical implants. Although there is a biomechanical advantage of using tilted distal implants rather than distal cantilever units.

Tasneem Begg (2009)⁶ does a study to know the qualitative descriptive analysis of stress patterns around the distal angled implant of the All-on-four concept and found that for the implants placed at 15 and 30 degrees angles, little difference in stress pattern is their between the straight and the distally angled implants. Peri-implant bone surrounding the 45 degree-angled distal abutment may be more prone to occlusal overload then bone surrounding implants with lesser tilts.

Macro Degidi (2010)⁵ evaluated the concept of intraoral welding as a suitable technique for the fabrication of a restoration for the edentulous atropic

maxilla on the day of placement of axial and tilted implants, and found that it is possible on the day of implant placement surgery to successfully rehabilitate the edentulous maxilla with a fixed, definitive restoration supported by an intraorally welded titanium framework attached to axial and tilted implants.

Kyea Soon Kim (2011)⁷ examined photo elastically the effect of the inclination of the two distal implants according to the All-on-Four concept on the stress distribution within the supporting structure, within the limitations of the photo elastic stress analysis author found that, the use of tilted implants reduced the maximum stress in the distal crestal bone of the distal implant by approximately 17% relative to the axial implants.

CONCLUSION

The All-on-four concept enables avoidance of more complex surgical protocols such as maxillary sinus floor augmentation. This concept is aimed at combining an optimized use of the available bone with the benefits of immediate loading, these methods lead to more simple, more predictable, less expensive, and less time consuming treatment when compared to maxillary sinus augmentation.

REFERENCES

1. Christopher C K. Implant rehabilitation in edentulous jaw: the All-on-four immediate function concept. Australian dental practice march/april 2012
2. Malo P, de Araujo Nobre M, Lopes A. The use of computer-guided flapless implant surgery and four implants placed in immediate function to support a fixed denture: preliminary results after a mean follow-up period of thirteen months J Prosthet Dent. 2007;97(6 suppl):S26–34.
3. Capelli, M., Zuffetti, F., Testori, T. & Del Fabbro, M. (2007) Immediate rehabilitation of the completely edentulous jaws with fixed prostheses supported by upright and tilted implants. A multi-center clinical study. The International Journal of Oral & Maxillofacial Implants 22: 639–644.
4. Krekmanov L, Kahn M, Rangert B, Lindström H. Tilting of posterior mandibular and maxillary implants for improved prosthesis support. Int J Oral Maxillofac Implants 2000; 15: 405-414.
5. Macro Degidi. Immediate loading of the edentulous maxilla with Definitive Restoration Supported by an Intraoral Welded Titanium Bar and Tilted Implants. INT J ORAL MAXILLOFAC IMPLANTS 2010;25:1175-1182.
6. Tasneem Begg. Stress Patterns Around Distal Angled Implants In The All-On-Four Concept Configuration. INT J ORAL MAXILLOFAC IMPLANTS 2009;24:663-671.
7. Kyea Soon Kim. Biomechanical Comparison of Axial and Tilted Implants for Mandibular Full-Arch Fixed Prostheses. INT J ORAL MAXILLOFAC IMPLANTS 2011;26:976-984
8. Antonios Zampelis. Tilting of Splinted Implants for Improved Prothodontic Support: A Two Dimensional Finite Element Analysis. J Prosthet Dent 2007;97:s35-s43
9. www.nobelbiocare.com

Corresponding Author :

Dr. Shivani Bhardwaj
P.G Student
Dept. of Prosthodontics
Modern dental college & research
centre .Indore.