

All on Four Implants: An Indemnified Option in Resorbed Ridges!

Prapti Praveen¹ and Deepa Jayashankar^{2*}

¹Post-Graduate Student, Department of Prosthodontics, The Oxford Dental College, Bengaluru, India

²Reader, Department of Prosthodontics, The Oxford Dental College, Bengaluru, India

*Corresponding Author: Deepa Jayashankar, Reader, Department of Prosthodontics, The Oxford Dental College, Bengaluru, India.

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Abstract

In clinical practice, many a times, fixed prosthesis for edentulous patients requires alternative approach due to severely resorbed ridges or large antra or financial reasons preventing placement of a sufficient number of implants for prosthetic rehabilitation. The rehabilitation of such arches requires bone graft, bone augmentation procedures to facilitate implant placement and loading for function. However, to avoid additional surgeries, cost, extended length of treatment, and co morbidities precluded others to become innovative and to circumvent these procedures and problems. In an effort to solve this problem, the concept of angled distal implants was introduced. This technique favoured many clinicians in terms of stability, anchorage, retention and immediate loading of implant supported prosthetic treatment. It also eliminated many problems of cantilevering and additional surgical protocols like grafting or augmentation that is usually encountered in treatment plan of implant retained prosthesis.

The aim of this article is to systematically review the literature on All on Four Implants regarding its principle, evolution, biomechanics inclusion criteria and prosthetic management.

Keywords: Implants; Resorbed Ridges; Prosthesis; Grafting; Augmentation

Introduction

Implant supported prostheses in rehabilitation of edentulous arches has been the line of treatment considering the biomechanics, stability and patients comfort. The availability of bone poses a main factor to decide the success of Implant treatment.

The maxillary bone anatomy itself presents with rationale, which poses the bone vulnerable to resorption. The cortical plates, which are continuous with the compact layer of maxillary and mandibular body, are generally thinner in the maxilla, and also the outer cortical plate is perforated housing many blood vessels and lymphatics. The anterior region of maxilla shows the fusion of cortical plate with alveolar bone proper and absence of sponge bone, thereby the outer alveolar wall defects are common.



Figure 1

On radiographic study, the architecture of the bone can be classified as:

- Type 1: Which consist of interdental and interradicular trabeculae, which are more regular.
- Type 2: Shows irregularly arranged, delicate interdental and interradicular trabeculae

Type 1 is commonly seen in the mandible but type 2 even though categorized as functionally satisfactory, lacks trajectory pattern or force which is ideally seen in mandible, which is therefore compensated by greater number of trabeculae which forms the architecture of maxilla. The number of trabeculae becomes less prominent at the proximity of nasal gallery and the maxillary sinus which again contributes to severe resorption pattern seen in maxilla after tooth loss.

As a sequelae to tooth loss there is osteoclastic activity, with localized pathologic loss of bone leading to resorption and the rate of resorption varies from patient to patient. The residual ridge resorption pattern with pathophysiology of bone remodelling is continuous process which is chronic and irreversible.

The rehabilitation of such arches with implant supported prosthesis even though advantageous is clinically quite challenging. The primary reason of using dental implants to replace missing

teeth is to maintain alveolar bone. The problem arises, when there is no sufficient bone to rehabilitate such arches.

The anatomic variations in the maxilla and the residual ridge resorption pattern show severe resorption and atrophy. The rehabilitation of such arches requires bone graft, bone augmentation procedures to facilitate implant placement and loading for function.

The concept of "All on four" which uses tilted implants in the posterior is used to restore edentulous arches which is a promising alternative to bone augmentation procedures. So, placement of four implants, two in anterior and two in posterior helps to rehabilitate the full arch and also prevent grafting when there is minimal bone.

The mandibular anatomical variations showing extensive residual ridge resorption and also more rapid resorption, is often difficult to rehabilitate with implants. The proximity of residual ridge to the mandibular nerve poses a challenge in placement of implants.

The "All on four" implant placement in mandible with distal tilted implants, avoiding the proximity to nerves is simple solution to solve this problem and also improves antero-posterior spread thereby increasing the stability of prosthesis. This concept is a proven technique as it helps to address the compromised clinical scenarios of resorbed bone, difficult jaw relations and patient's economical status.

When we consider a conventional implant procedure the risks of bone grafting and patient's acceptance dictates the success and most of the time the surgical complications pose a higher morbidity and recovery time [1-4].

The primary concept for the success in patients with compromised bone has been the introduction to all on four concept given by Nobel Biocare, Goteborg, Sweden. Maló and colleagues was credited with the first description of this concept in 2003 [5]; however, Brånemark and colleagues has already described similar approaches.

The evolution of the "all-on-4" concept and biomechanics

Branemark and colleagues are the pioneers of this concept and they introduced it in 1977, utilising 4 - 6 implants in the anterior maxilla and mandible cantilevered to accommodate a full arch prostheses.

Although there is good success from their 10-year study (78.3% - 80.3% for the maxilla and 88.4% - 93.2% for the mandible), the cantilever remains too long and problematic, having to extend and provide adequate posterior dentition.

The use of angulated distal implants and success can be attributed to the work of Mattsson and colleagues [3] in 1999, where 15 patients with severely resorbed edentulous maxilla were treated with 4 - 6 implants inserted in the premaxilla thus avoiding sinus

augmentation. They restored the implants with prosthesis of 12 teeth supported by superstructure where the alveolar ridge heights were 10 mm or less with 4 mm in horizontal width. Only one failure was reported in a period of 3 to 4.5 years. This study supports the use of angulated implants for fixed prosthesis as compared to grafting procedures [3].

The difficulties associated with a long cantilever were addressed by the work of Krekmanov and colleagues in 2000, where they were able to demonstrate by increasing the anterior- posterior spread thereby shortening the cantilever. The angulation also provides the opportunity for longer implants to be placed while moving the implant support posteriorly and enhancing load distribution. A rigid prosthesis directs the forces on implants [4,5].

"All on four" immediate loading

When we speak about loading of an implant considering the protocol of optimized healing period it can be done either by Branemark's protocol where it follows two stage procedure or immediate loading (functional or non-functional). Studies have shown success in clinical follows up of edentulous mandible using a surgical guide for positioning of four implants between the mental foramina for a favourable prosthetic support. Loading was done using provisional all-acrylic prosthesis, delivered within 2 hrs after surgery [6].

Whereas there is very few literature support for immediate or early loading in edentulous maxilla due to lower bone density and also the implant anchorage in maxilla is restricted in posterior region due to bone resorption which requires bone grafting. But with use of tilted implants in posterior maxilla has been demonstrated favourable in an improved implant anchorage.

The placement of two distal implants in zygoma at 45 degree angle emerging at molar region, transversing the sinus at a distant site as proposed by Branemark is favourable to immediate loading of the implants. This principle favouring immediate loading is a boon to a skilled clinician accomplishing the technique of immediate loading and patient's comfort.

When there is insufficient bone in premolar and molar regions with only available bone in the premaxilla, then it is a clear case for zygoma implants. Bedrossian categorizes the maxilla into 3 zones radiographically: zone 1= premaxilla, zone 2 = premolar, zone 3= molar.

The implant configuration will be 2 axial implants in the anterior position and 2 zygoma implants in the posterior region.

When there is severe resorption and no bone present in maxilla then the concept of quad zygoma with four zygomatic implants can be used to support a fixed prosthesis.

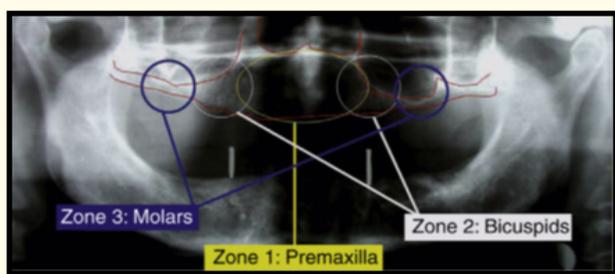


Figure 2

In severe mandibular atrophy where there is 5 - 7 mm of native bone available, Jensen and Adams in 2009, reported placement of four implants in anterior mandible at 30 degree angle for supporting full-arched prosthesis [7-10].

Patient Selection and Evaluation

Clinical evaluations, radiographic evaluations, and laboratory analysis of mounted models with duplicate clear denture aids in future prosthetic design.

Clinical evaluation includes intra oral examination, assessment of vertical dimension, inter ridge space, residual alveolar ridge, smile line, lip line (high or low lip line), lip support, facial profile and occlusion.

Patient's existing denture or previous photographs can be a guide for assessing and verifying the vertical dimension of occlusion and for planning full mouth rehabilitation.

Considering these clinical assessments two basic hybrid design prostheses are available, namely, Fixed-hybrid and fixed-removable prosthesis (Marius Bridge) based on the visibility of the ridge where in, the Marius bridge is a promising option when there is visibility of ridge.



Figure 3

There are wide variety of prosthetic options available to rehabilitate all on four implants for a fixed prosthesis considering the titanium and Zirconia framework available, while titanium implant bridge with acrylic teeth and acrylic gingiva being the basic one. Such prosthesis can accommodate attachments like locators, balls or clips or bars like dollder, milled bar etc. to support the superstructure.

For final occlusion, esthetic and function, 12 teeth are incorporated into final prosthesis with canine and anterior guidance. Bilateral group function also can be considered as the case per se.

Discussion and Conclusion

Implant dentistry being the most specialized field enables a practitioner for a more promising and predictable treatment option. Immediate loading enables the function and esthetics available, without a time lag, and has become the choice for patient as well as the clinician in today's scenario. The all on four concepts has gained popularity due to the fact that many additional procedures of sinus augmentation and bone grafting can be avoided and a more definitive implant option such as angulated or zygoma implants can be considered.

An attempt has been made here to review the all on four concepts for completely edentulous atrophic jaws. The several long term studies and immense literature supports and favours the acceptance of this concept in full arch rehabilitation.

Placement of dental implants previously in attempts to treat the severely resorbed jaws has had only limited success. But the rehabilitation of completely edentulous jaws, atrophied ridges by placement of implants using all on four protocol gives new hope for a perceivable success, while becoming a promising treatment method of choice and standard in care for severely compromised patients. This multidisciplinary treatment option with the pursuit to perfection becomes mandatory to every clinician to consider the advantages of this concept for improving patient's quality of life [11-22].

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