

All on 4 Concept in Dental Implants: Short Review



Medical Science

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***Dr Avinash V Mehandale**

Senior lecturer , AJ Institute of Dental Sciences , Mangalore * Corresponding Author

Dr Mithun upadhya

Senior Lecturer ,AJ Institute of Dental Sciences , Mangalore

ABSTRACT

Edentulous state causes a negative impact on anatomic, aesthetic and psychological aspect of an individual. Advances in dental implants have changed the routine approach of fabrication of conventional complete denture for management of completely edentulous patients. Osseo-integrated dental implants significantly improved the quality of life for edentulous patients in comparison with conventional complete dentures and also overcomes the drawbacks associated with conventional complete dentures. In the recent years this protocol for placing dental implants has changed where it is encouraged to place fewer implants for immediate loading. Hence the concept of using two axially implants in the anterior region and two tilted posterior implants has been popularized as the All On four concept. The purpose of this article is to review the advantages, indications and prosthetic considerations for placing dental implants with immediate loading using the All-on-Four concept.

Introduction

Edentulous state causes a negative impact on anatomic, aesthetic and psychological aspect of an individual. Evidence based studies have shown that despite decreasing edentulous states among the ageing population, the unmet need for complete denture treatment will still remain high even in developed nations.¹ Advances in dental implants have changed the routine approach of fabrication of conventional complete denture for management of completely edentulous patients. The common complaints associated with conventional complete denture are pain, discomfort, poor retention and stability, decreased masticatory performance and decreased oral sensory function. There is enough literature to show that osseo-integrated dental implants significantly improved the quality of life for edentulous patients in comparison with conventional complete dentures.²⁻⁶ The usual protocol of immediate loading for implant supported dental prostheses involves placing of several implants, of which some are submerged and are included in the prosthesis at the time of second stage surgery. In the recent years this protocol has changed where it is encouraged to place fewer implants for immediate loading.^{7,8} Stress analysis studies have demonstrated that four implants placed as "cornerstones": two posteriorly and two anteriorly, with good anterior-posterior distance (AP- spread) is an optimal number for complete-arch prosthesis.⁹ This concept of using two axially implants in the anterior region and two tilted posterior implants has been popularized as the All On four concept.

The purpose of this article is to review the advantages, indications and prosthetic considerations for placing dental implants with immediate loading using the All-on-Four concept.

Indications¹⁰⁻¹¹

- 1) Maxillary/mandibular bone quality which allows for placement of at least four implants of at least 10mm in length in either healed or immediate extraction sites
- 2) Good systemic health with satisfactory oral hygiene
- 3) Implant should achieve good primary stability at insertion

One of the hallmarks of All-on-Four concept is tilting of the posterior implants. Tilting of implants may actually be beneficial both anatomically and biomechanically. In the mandible tilting gives good cortical anchorage without interfering with mental foramina and in severely resorbed posterior maxilla the need for sinus floor augmentation is reduced. Tilting also increases inter-implant space and reduces cantilever length thus improving the bio-mechanics of implant and bone.

Advantages of All-on-Four concept

- 1) Fewer implants required for immediate loading of implant supported prostheses
- 2) Longer implants can be placed with good cortical anchor-

age in resorbed ridges.

- 3) Immediate function and aesthetics.
- 4) Reduced posterior cantilever.
- 5) Final prostheses can be fixed or removable.
- 6) Good success rate
- 7) Cost effective since less number of implants are involved.

Surgical protocol and implant placement¹⁰⁻¹³

After assessing the general health and intra-oral examination, preferably a diagnostic cone beam computed tomography (CBCT) is advised to assess the quality and quantity of bone.

Local anesthetic injections (both nerve block and infiltration) are given to the patient in combination with sedation if required. Prophylactic antibiotic and anti-inflammatory therapy is prescribed for the patient and continued post surgically as prescribed. Also, oral hygiene instructions are given including the use of a chlorhexidine mouthwash during the healing process. Full thickness flaps with mid-crestal incisions are raised to expose the ridge. Minor alveotomy procedures can be carried out with bone rongeurs or burs to level the ridge.

In the maxilla two distal implants are placed in the posterior region which is tilted anterior to the maxillary antrum, while in the mandible implants are positioned anterior to the mental foramen. The degree of tilt is at angulation of 30-45 degrees. A pre-fabricated All-on-4 surgical guide is used which helps in correct positioning, angulation and emergence of implant. Vertical lines are marked on the guide which helps for drilling at the correct angulation, which should not be greater than 45 degrees. An implant of appropriate diameter and length with a good osteoconductive surface is placed. Abutments straight, 17° multiunit abutments or 30° angulated abutments with different collar heights are placed onto the implants.

Prosthetic protocol¹⁰⁻¹³

Impression technique used for this procedure is open tray with multi-unit impression copings which are splinted with autopolymerising pattern resin and wire bars. Splinting with resin ensures accurate transfer without any displacement of impression copings. Impressions are made with a rigid polyvinyl siloxane impression material.

A provisional restoration fabricated with heat cure acrylic resin is delivered to the patient on the same day. The provisional restoration has short cantilevers to minimize load and possible fracture of the prostheses. The occlusal contacts should be in inter-canine region and a canine guided occlusion is indicated in lateral movements without any interference in centric and eccentric movements. Definitive prosthesis is delivered after 3-4 months of surgical procedure.

Final prosthetic protocol

The final prosthesis can be a:

1. CAD/CAM designed fixed prosthesis with Zirconia or Titanium framework with individual crowns is cemented to the final bridge framework.
2. Fixed prosthesis with CAD/CAM designed Titanium or Zirconia framework with a wraparound of acrylic resin
3. Fixed prosthesis with cast metal and veneering porcelain.
4. Removable prosthesis: bar overdenture, attachment overdenture

Survival rate

According to evidence based studies the implant survival rate using this concept was 97% -98% with minimum marginal bone loss which meets the Albrektsson criteria

Discussion

Malo P et al has popularized and published the All-on-4 concept of using two axially implants in the anterior region and two tilted posterior implants with good cumulative survival rates. He also did studies on immediate loading of four implants placed in the edentulous mandible and concluded that immediate loading protocol had 96.7% and 98.2% implant cumulative survival rates.¹⁴ According to studies by Babbush et al the overall survival rate for one year was 99.6% without any significant difference between maxilla and mandible with the prosthesis survival rate of 100%. One of the features of All-on-4 concept is tilting of the posterior implants.¹² Krekmanov L and Bellini CM in their studies on stress analysis on tilted implants have shown no significant difference between tilted and non-tilted implants.¹⁵ Krekmanov L also concluded that tilting of implants provides larger prosthetic base thus reducing the force acting over the implants. Misch E C in his study on immediate loading put a word of caution that additional long term studies are required to advocate immediate loading as a treatment option especially in maxilla. Zarb G, based on literature reviews has stated that the future of immediate implant loading looks promising and stresses on improvement of implant design at molecular level for success of immediate loaded implants.¹⁸ According to a study by Malo P, among the various treatment options for replacement in All-on-Four concept, reinforced acrylic prosthesis provides the best solution during healing phase and it is also a low cost prosthesis.¹⁰ Few practitioners are of the opinion that since this is a unique procedure which involves specialized implants and specifically trained professionals, this turns out to be an expensive treatment compared to conventional implant prosthesis. But Babbush in study revealed a significantly higher decrease in cost for the All-on-4 procedure compared to conventional implant restorations.¹⁹

Conclusion

Finally to conclude immediate loading of implants using All-on-Four concept is an excellent treatment option both edentulous maxilla and mandible. The cumulative survival rates, marginal bone loss and other bio-mechanical factors are similar to better than that of conventional implant treatment. Also since less of numbers of implants are involved the cost of this procedure is reasonably less when compared to conventional fixed implant prostheses.

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