

Implant Supported Mandible Over Denture with Four Implants Key Facts

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ABSTRACT

Implant retained over denture (IRO) is a satisfactory treatment modality for edentulous patient with problems with their lower denture. There are good reasons why this treatment should be selected in preferences to using tissue supported dentures. There are certain rules that provide a method to control the mechanical environment, addressing factors effecting implant and prosthesis longevity, including magnitude of forces, resistance of prosthesis against these forces, and the biology of bone and its ability to respond to loading environments.

Materials and methods: Ten edentulous patients were selected for implant retained prosthesis for the mandible, with minimum four implants in parasymphysis region and prosthesis were delivered after period of 3 months.

Conclusion: Certain important points needs consideration for successful prosthesis and its longevity.

Keywords: Implant, Overdenture, Mandible, Planning, Edentulism.

Key message: The report provides simple rules for treatment planning in implant therapy in edentulous mandible with minimum of four implants that both acknowledge and control the mechanical environment. This influences the success of both the end osseous dental implants and the prosthesis and can offer lasting success for treatment of edentulous mandible.

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INTRODUCTION

Approximately 17 years ago Steenberghe¹ proposed possibility of using over denture supported by two Branemark implants to treat mandible denture problems with 98% success rate, he further elaborated of placing fewer implants in advantageous sites rather than placing as many implants in limited space to completely rehabilitate an edentulous ridge for fixed or over denture prosthesis. The contemporary literature demonstrates high degree of survival over 10 to 20 years time horizon when implants are placed in the parasymphyseal mandible and restored with implant retained over denture or implant retained fixed prosthesis.²⁻⁵ These studies invoke inclusion and exclusion criteria that favor success, benefit from local factors of mandible bone quality and quantity, and commonly employ the use of opposing maxillary denture. In order to provide a conceptual

framework to manage treatment of edentulism using dental implants, three rules for treatment planning affecting implant and prosthesis longevity have been addressed which provide rationale to support general rules and illustrate their application in treatment planning.

MATERIALS AND METHODS

Ten complete edentulous patients were selected with average resorption of mandible (bone available in parasymphysis region >10 mm). Four implants with average length of 10 mm with width >3.5 mm were placed with prescribed surgical protocols. The prosthesis was based upon fabrication techniques utilizing methyl methacrylate and cross linked denture teeth. The materials provide functional substrate and esthetic foundation of implant based prosthesis. Patients criterias were (1) sufficient bone volume for implants with a length of 10 mm and a acceptable diameter >3.5 mm with one millimeter bone available around the crestal part of implants, (2) healed extraction sites (6 weeks or longer), and (3) satisfying dentures with respect to occlusion, esthetics, vertical dimension in occlusion, denture base extension and fit. The rejecting criterias included: (1) heavy smokers (>20 cigarettes per day), (2) need of bone augmentation, (3) a history of radiotherapy in the interforamina region, (4) systemic diseases precluding implant surgery.

DISCUSSION

There are certain rules which were followed in each of the patient; these points can be taken as important facts necessary for the implant supported denture fabrication in mandibular edentulism.

Fact 1

Inferior/superior dimension of the mandible must be ≥ 10 mm (Fig. 1).

This rule states that minimum alveolar dimension sufficient to support an implant retained prosthesis must be equal or greater than 10 mm.

The use of 10 mm or less in length in implant retained prosthesis is well-defined and successful.⁶ Majority of cases implant failures occurred before loading. The evaluation of 119 patients rehabilitated with four implants to support mandibular fixed prosthesis revealed 99.1% success rate.⁷ A 3-dimensional element model demonstrated that implant

length had no appreciable effect on stress distribution at the bone/implant interfaces when loaded by a cantilever prosthesis, suggesting that implant length does not dictate survival.⁸ A high survival rate (95.5%) with 20 years of loading. Although 21% of implants were 8.5 mm or shorter, implant length and bone quality did not affect implant survival.⁹ This concludes that implants of around 10 mm have equally high survival in the parasymphiseal region of mandible for IRO and increasing implant length beyond 10 mm does not improve biologic outcomes. Thus, a mandible of 10 mm height, or inferior-to-superior dimension, is sufficient for an IRO. When four implants of 10 mm cannot be placed in a severely resorbed mandible, additional implants of shorter dimension may be considered. For example, in an 8 mm mandible, the use of 8 mm or 9 mm implants might be considered if additional implants are included.

Fact 2

Interocclusal (restorative) dimension measured from ridge crest to occlusal plane must be ≥ 10 mm (Fig. 2).

This concept of restorative dimension was initially addressed by Phillips and Wong¹⁰ and reiterated by Lee and Agar;¹¹ however, there is little data in support of this inferior-superior dimension for planning of a mandibular IRO. Practically, the restorative dimension for any implant prosthesis includes four key components, each with its own minimum dimension. They are: (1) the transmucosal dimension (biologic width) of approximately 2 mm, (2) a supramucosal abutment height (0 mm to 2 mm) that permits hygiene, (3) a framework or attachment height between 3 and 5 mm, and (4) acrylic veneer thickness greater than 2 mm. It must also be acknowledged that the replacement mandibular teeth should accommodate their full contours. The average height of mandibular anterior teeth is approximately 10 mm. A minimum 10 mm of restorative space places average-size mandibular prosthetic teeth precisely at the soft-tissue crest with only a minimal dimension for the prosthetic components.

It becomes evident that the planning of an implant-supported or implant-retained prosthesis for the edentulous mandible begins with defining a superior-inferior reference, namely, the occlusal plane. Space accommodation for the dimension and location of teeth, frameworks, attachments, retaining abutments (balls, bars, etc), and biologic width will direct planning of implant position. Finally, the location of the osseous crest in relationship to the planned implant position dictates the extent of the alveolectomy required.

Fact 3

Anterior/posterior distribution of implants must be at least 10 mm (Fig. 3).

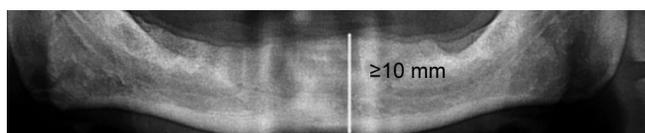


Fig. 1: Inferior/superior dimension of the mandible must be ≥ 10 mm

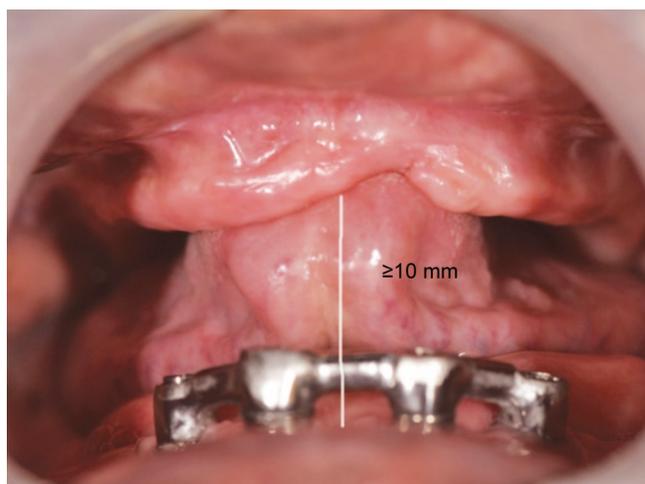


Fig. 2: Interocclusal (restorative) dimension measured from ridge crest to occlusal plane must be ≥ 10 mm

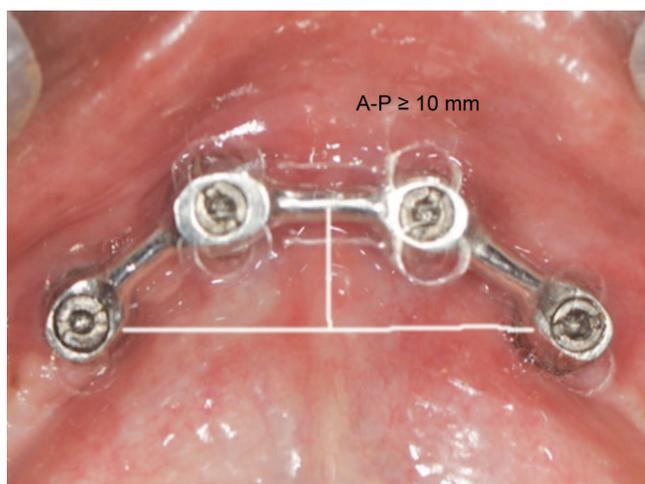


Fig. 3: Anterior/posterior distribution of implants must be at least 10 mm

The implants must be able to support functional loads at the posterior occlusal contacts via the cantilever. These loads, however, are magnified within the framework and components, and potentially at the implant/bone interface. In the early conceptualization of this therapy, the anterior-posterior distribution of dental implants was very important factor for the complications in the cantilevered prosthesis. Thus a maximum distribution of implants was recommended. This anterior-posterior distribution of implants is referred to as the ‘A-P spread.’ Clinicians were quick to point out that there were anatomic constraints for implant placement in the parasymphiseal mandible. Compared to curved or V-shaped mandibles, square-shaped mandibles often provide little anterior-posterior dimension anterior to the inferior alveolar

nerve. Additionally, anatomic variations in the inferior alveolar nerve (e.g. anterior loop) are not uncommon¹² and can reduce the available A-P spread.

Any discussion of cantilever length requires that: (1) the position of the distal-most implant is anticipated; and (2) the number of teeth to be provided distal to that implant be defined. For the purposes of establishing a concept that meets the needs of most patients, the goal is to have the distal implant in the distal-most location that does not impose on the inferior alveolar nerve, which is generally located in the canine or first premolar region. Further, distal inclination of the posterior implants may place the prosthetic interface even more distal in the first premolar region. The all-on-four concept generally requires that posterior teeth supported by a cantilever. Efforts to reduce or eliminate the cantilever by distal orientation of terminal implants are advocated.¹³

The geometric distribution of the implant-abutment and the abutment-prosthesis interfaces remain the significant features of IRO therapy that can be clinically managed to reduce complications.

CONCLUSION

The use of over dentures supported by implants or natural teeth was an efficacious modality for providing an improved chewing function for the completely edentulous patients. In our study certain facts are highlighted which may be very important in fabrication for successful diagnosis and treatment planning.

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