



Radiographic evaluation of OSSEAN surface treatment of mini-implant retaining mandibular overdenture

Thesis

**Submitted to Faculty of Dentistry at Ain Shams University in
Partial fulfilment of the requirements for the Master Degree in
Oral and Maxillofacial Prosthodontics**

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2014**



تقييم إشعاعي لتأثير (أوسيان) للمعالجة السطحية للغرسات السنية صغيرة القطر المثبتة للأطقم السفلية المحمولة

رسالة مقدمة إلى قسم الاستعاضة الصناعية بكلية طب الأسنان - جامعة عين شمس
للحصول على درجة الماجستير في الاستعاضة الصناعية للفم والوجه والفكين

مقدمة من

طبيب/ عمر عباس عصمت السادات
بكالوريوس طب وجراحة الفم والأسنان (٢٠٠٩)
كلية طب الأسنان - جامعة عين شمس

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INTRODUCTION

Restoration of the atrophic edentulous mandible with an overdenture supported or retained by two implants placed in the interforaminal region has thus become regarded as the first prosthodontic treatment option. Evidence indicates that physiological residual ridge resorption occurs in the anterior edentulous mandible at a rate 4 times greater than bone resorption occurring in the same location when dental implants have been used.⁽¹⁾

Mandibular Implant overdenture treatment can show significantly improved retention and stability characteristics as compared with conventional mandibular complete dentures. Additionally, a direct relationship has been shown between prosthesis retention and stability and patient satisfaction.⁽¹⁾

The use of narrow diameter implants (approximately 1.8mm to 2.4mm in diameter) has been suggested in order to reduce trauma for elderly patients when the use of standard-sized implant would require bone reshaping and grafting. Advantages of this procedure include implant placement in narrow sites, minimally invasive surgery, and immediate loading of the implants.⁽¹⁾

The physicochemical characteristics of the dental implant surface play the most significant role in early acceptance and immobilization of the implant in the tissue bed and the long term

success of Osseo integration. Surface roughness of titanium implants affect the rate of the speed and amount of bone tissue formed at the implant-bone interface.⁽¹⁾

Several surface modifications have been developed and are currently used with the aim of enhancing clinical performance, including Hydroxyapatite (HA) and calcium phosphate (Ca P) coatings, titanium plasma sprayed, ion deposition electro- or mechanical polishing, grit blasting, acid-etching, grit-blasting followed by acid-etching and oxidation, as well as combinations of these procedures.⁽²⁾

Surface profiles in the nanometer range play an important role in the adsorption of proteins, adhesion of osteoblastic cells and thus the rate of Osseo integration.⁽²⁾

The Ossean Surface structure engineered to increase host to implant biocompatibility and biomechanical response. It is characterized by having a surface topography that is similar at all levels of magnification, from the surface to the Nano scale level. The repetitive nature of this surface is defined as one that is 'fractal' in nature. The surface beyond the nanometric level displays an ideal surface of fibrin attachment. At the micrometric level, the pattern is appropriate for platelet deposition. Under lower magnification, the pattern shows receptor sites that encourage the growth of osteoblasts.⁽³⁾

Calcium Phosphate molecules are present in the titanium oxide layers as molecules (more than a thousand times smaller than Nano particles) as molecular impregnation. These molecules have a greater binding energy than larger particles of calcium phosphate.⁽³⁾

EDENTULISM

Loss of all permanent teeth is defined as Edentulism. Edentulism is due to various combinations of cultural, financial and dental disease attitudinal determinants towards treatment. ⁽⁴⁾

An intimate relationship exists between teeth and alveolar process. The lack of mechanical stimulation resulting from the loss of teeth in the edentulous state results in loss of the bone mass. This is accompanied by a decrease in the bone trabeculae and bone density in the area in addition to loss of bone width followed by loss in bone height. ⁽⁴⁾

The marked reduction in mandibular residual ridge compared to that of the upper residual ridge increased 4:1 at the seven-year stage, The average reduction in anterior height of the lower ridge during the twenty five year complete denture wearers would account to 9 to 10 mm whereas in the maxilla the reduction may only be 2.5 to 3 mm. The Continued residual ridge resorption results in loss retention, support and stability. ⁽⁵⁾

As bone loss occurs in width and height respectively, the attached gingiva gradually decreases resulting in a thin area of attached tissue that may be absent over the advanced atrophic mandible. This makes the tissue prone to abrasions caused by the overlying prosthesis. ⁽⁵⁾

The tongue of the patient with edentulous ridges often enlarges to accommodate the increase in space formerly occupied by teeth. At the same time, the tongue is used to limit the movement of the removable prostheses and takes a more active role in the masticatory process.⁽⁵⁾

Retention and stability problems of the mandibular prosthesis often cause complaints of masticatory function in complete denture wearers. Complete denture wearers needed on average four times, six times, and even eight times the number of chewing strokes in dentate persons to achieve the same degree of pulverization.⁽⁶⁾

One of the factors leading to the decrease in chewing performance is the reduced bite force. Edentulous subjects who obtained with maximum clenching (unilateral) biting forces that range 77 to 135 N, whereas the average maximum bite force (unilaterally measured) for dentate persons varies from 306 to 487N.⁽⁷⁾

The facial changes that naturally occur in relation to the aging process can be accelerated and potentiated by the loss of teeth. A decrease in the facial height from a collapsed vertical dimension causes several facial changes. As the vertical dimension progressively decrease, the occlusion evolves towards a pseudo – Class III malocclusion. As a result the chin rotates forward and creates a prognathic facial appearance.⁽⁸⁾

Loss of teeth affects the functional abilities such as speech and mastication as well as the patient's esthetics, psychological well-being, and quality of life.⁽⁹⁾

Treatment modalities for Rehabilitation of Completely edentulous

i. Complete Denture

For many decades complete tissue-supported removable prostheses have been regarded as the treatment of choice for edentulous patients.⁽¹⁰⁾

The ideal denture supporting ridge should have adequate bone height with a flat crest and parallel or nearly parallel sides covered by firmly attached fibrous mucoperiosteum, with adequate buccal and lingual sulci. It should be devoid of any undercuts or overhanging protuberances, scar bands, muscle fibers or frenula that interfere with the periphery soft tissue folds, hypertrophies and neoplasms.⁽¹⁰⁾

Pre – prosthetic surgical techniques are used to reshape the ridge in order to give an optimum denture supporting area that is suitable for the future prosthesis. Moreover, they provide sufficient bone volume for placement of dental implants at the most optimal positions. Vestibuloplasty, ridge augmentation by autogenous bone graft or by alloplastic material, vertical alveolar ridge distraction and guided tissue regeneration were introduced.⁽¹¹⁾

Despite the fact that complete dentures are known to have poor masticatory capability. The most common complaint is the 'loosening' of the dentures which is often due to the continual resorption of the alveolar ridge. Moreover, patients complain of intolerance to loading by the mucosa, pain, difficulties with eating and speech, loss of soft-tissue support, and altered facial appearance.⁽¹²⁾

ii. Over denture

An over denture is " removable partial or complete that covers and rests on one or more remaining natural teeth, roots and/or dental implants". Another definition describes it as " A prosthesis that covers and is partially supported by natural teeth, teeth roots and/ or dental implants ".⁽⁴⁾ Over dentures are classified according to type of support into:

a) Tooth Supported Over denture

One therapeutic approach directed at improving oral function in elderly edentulous patients is the use of over dentures.⁽⁶⁾

Tooth supported over dentures rely on the remaining teeth to support the prosthesis. The location of these natural abutments is highly variable, and they are often compromised from past bone loss associated with periodontal disease.⁽⁶⁾