The Effect of Two Types of Mini-Implant Attachments on the Supporting Structures of Immediately Loaded Implant Retained Mandibular Single Overdentures.

A Thesis

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By

Ahmed Yehia Abdel Moneim

BDS, 2004

M.D.S, 2011

Cairo University

Faculty of Dentistry

Ain Shams University

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Supervisors

Prof. Dr. Ingy Amin Talaat Lebshtien

Professor of Prosthodontics

Faculty of Dentistry

Ain Shams University

Dr. Ahmed Mohmed Osama Ahmed Shawky

Associate Professor of Prosthodontics

Faculty of Dentistry

Ain Shams University

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا ۖ إِنَّكَ أَنتَ
الْعَلِيمُ الْحَكِيمُ)

صدق الله العظيم

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Introduction

Patients with single complete dentures usually suffer from difficulties in retention and stability especially with the lower denture.Several difficulties are encountered in providing a successful, single complete denture treatment. The firmness with which the natural teeth are retained in bone and the magnitude of force exerted by these teeth during function are not usually tolerated either by the single denture or the supporting residual ridge. This results in problems in the retention and stability of the denture and an accelerated rate of residual ridge resorption. Forces exerted by the opposing natural teeth also result in frequent single denture fracture.

The occlusal form and inclination of the remaining natural teeth and the occlusal plane dictate the occlusal form of the denture, and the forces to which the single denture is subjected.

Implant supported and retained overdenture is a promising treatment option for patients with mandibular single complete denture. Implant supported overdenture is attempted to overcome the problems of retention, support and stability of single dentures by the utilization of strategically placed implants. Additionally the chewing efficiency is improved due to the enhanced stability and retention.

Recently successful oral rehabilitation with mini implants in more definitive treatments has been reported for partially and completely edentulous patients. In comparison with conventional diameter implants, Mini Dental Implants (MDIs) are cost effective, have fewer complications during flapless implant placement and can

be used in edentulous arches with minimal remaining bone in a faciolingual dimension to avoid bone graft. MDIs also have the advantages of single stage conventional diameter implants including; short healing time, minimal postoperative discomfort, and immediate restoration of mastication and esthetics for patients during the healing period.

Despite of the advantages provided by mini implant, decreasing the diameter increases the risk for implant fracture because of reduced mechanical stability and the risk of over loading. In order to compensate for reduced MDIs diameter and surface area, it is recommended to increase the number of implants with maximum length (according to the available ridge height) to improve initial stability instead of the conventionally used two implants to support and retain mandibular overdentures.

O-rings are ball and socket attachments used with MDIs, they are used as anchors to retain and stabilize lower overdentures. The attachment consists of a ball connected to mini-implant and a metal housing incorporated into the base of the denture.Arubber O-ring that houses in the metal housings is used to seal and lock the pieces into place·

Mini implant using a smaller version with ERA attachment was introduced.This attachment overcomes the space problem because all of its bulk is housed within the root portion of the abutment. Lateral forces are not entirely transmitted to the abutment because the male part can bend during slight movement of the denture. Low-profile implant ERA, overdenture attachment was used to reduce the abutment restoration height on implants.

The ERA males are made of nylon and are color coded by the manufacturer according to the amount of retention .The black male is used for processing in the overdenture. It creates an undercut male-retention socket in the denture acrylic resin.It also allows for the creation of 0.4 mm of resiliency in the final restoration.The primary retention of ERA comes from the friction between the metal female and nylon male on the inner side of the ring; however, the wall outside the ring may play a role on the retention as well. The ERA males act as a hybrid ball-and-socket attachment, allowing vertical resiliency and universal stress relief for use when a resilient prosthesis is indicated.

Over the years, several methods has been employed to diagnosis, evaluate, and balance occlusal forces , however none of them accurately detect and assess simultaneous contact, and measure both the biting time and force . The computerized occlusal analysis system T-Scan introduced in 1987 helps in measuring occlusal biting forces, and aid in obtaining consistent and useful occlusal data for evaluating occlusal contacts for removable prostheses.

The ultimate choice of attachment type should be based on clinical performance of the attachments regarding the functional occlusal stability,loads onto the implants and surrounding tissues; the patients' satisfaction with treatment, the technical problems and maintenance service as well as attachment costs. Although, Long term studies have been published evaluating the effect of Mini- dental implant on the peri-implant bone loss, however there is rareness of studies on the effect of mini-implant attachment on peri-implant bone loss and functional occlusal stability in single denture.

Review of Literature

Single Dentures

Single denture is “a complete denture that occludes against some or all of the natural teeth, a fixed restoration or a previously constructed removable partial denture or a complete denture.” [1]

The prognosis of maxillary single denture is usually more favorable than mandibular single denture. This is probably due to the larger bearing area of the maxillary edentulous arch which is 22.96cm^2 average surface area compared to the mandibular edentulous one which is 12,25 cm^2 average surface area , the possibility of more positive support, stability and retention, and the ease of developing tongue habits to aid in supporting the denture.[2,3]

An uneven alignment of natural teeth is encountered in practically every person exhibiting a single edentulous arch. This is usually due to the premature loss of teeth together with delay in obtaining replacements. Loss of teeth may thus lead to overeruption and extrusion of the opposing teeth, drifting, tipping and tilting of adjacent teeth causing irregularities and malposition of the occlusal plane. [3]

Tipping is generally associated with the interruption of a continuous dental arch, while extrusion is associated with malrelationship with antagonists. This causes decrease or loss

of function and loss of interarch space leading to excessive biting forces with troubles in the temporomandibular joint. Occlusion on a tipped or an extruded tooth will often result in disruption of occlusal harmony. It may lead to locking of occlusion and the production of forces that tend to unseat dentures. Masticatory forces are often misdirected as a result of these changes. Thus occlusal interferences must be detected and corrected whenever possible. In addition a difference usually exists between the sizes of a dentulous maxillary or mandibular arches opposed by an edentulous arch. [4]

Patients showing an occlusal scheme that is excessively worn were reported to have strong masticatory forces in lateral excursions. A single denture for a patient with worn dentition is the most difficult to construct inspite of less lateral forces applied, but due to the unequal size of the dentulous arch in relation to the edentulous arch due to bone resorption. Resorption occurs labially and buccally in maxillary edentulous arches leading to setting up of the teeth outside the crest of the ridge causing leverage and instability of the maxillary denture. Also, the pattern of bone resorption of mandibular edentulous arch is lingual which may lead to setting up of the artificial teeth inside the crest of the ridge leading to instability of the lower denture due to encroaching on the tongue space. The cusps of relatively unworn dentition denture have a far more favorable prognosis, although presenting problems of steep cusps and the associated resolution of forces that tend to dislodge the denture. [5]

It was reported that changes occur after maxillary teeth extraction and result in a comparatively smaller maxilla when compared with the dentulous state. This results in a horizontal discrepancy between the arches anteriorly and posteriorly and makes it difficult to direct forces to the maxillary denture-bearing surface. This is because support is far away from the denture tooth position. The best solution for correcting this variation posteriorly is to place the teeth in a reverse horizontal overlap (cross bite arrangement). However, for the anterior discrepancy, it is not possible to achieve such correction due to esthetic reasons affecting the support of upper lip. [6]

A narrow maxilla opposed by a broad mandible usually presents complication to the prognosis of complete denture as a result of unfavorably directed masticatory forces. When cross bite of the natural teeth exists, extreme care must be taken not to place any portion of the artificial teeth outside the confines of the denture. Improper tooth placement results in a denture that tends to be unseated. When any doubt exists about proper tooth position it is better to articulate teeth in a cross bite relationship. [6]

The ability of the patient to generate heavy occlusal forces, due to the existence of opposing natural teeth leads to midline fracture of denture base. The unsuitability of the denture foundation tissues to resist high occlusal forces from the opposing natural teeth results in an advanced bone loss of the residual alveolar ridges**.** Flexible dentures are a promising