Effect of using different abutment materials on retention of BioHPP telescopic implant retained overdenture

Thesis submitted to the Faculty of Dentistry, Ain Shams University for Partial Fulfillment of the requirement for the Master Degree in Oral and Maxillofacial Prosthodontics

By

Rania Abd Elsattar Mangood Ramadan

B.D.S (2013), Ain-Shams University

Ain-Shams University

2019

Supervisors

Prof.Dr. Rami Maher Ghali

Professor of Oral & Maxillofacial Prosthodontics,

Vice Dean of Community Service and Environmental Development,

Faculty of Dentistry

Ain shams University

Dr. Yasmine Galal Eldin Thabet

Associate Professor of Oral & Maxillofacial Prosthodontics,

Faculty of Dentistry

Ain shams University


وَقُلِ اعْمَلُوا
فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ

Dedication

To the soul of my great father,

my amazing mom,

my loving big family,

my superhero husband,

and my little beautiful angel Linda,

thank you for your endless love and support

Acknowledgment

I would like to express my most sincere gratitude and grateful appreciation to professor ***Rami Maher Ghali***, Professor of prosthodontics, Oral & Maxillofacial Prosthodontics department, Faculty of Dentistry, Ain Shams University and Vice Dean of Community Service and Environmental Development. I am so grateful and thankful for his endless support, encouragement, understanding and enormous help and guidance.

My deepest thanks are extended to Dr ***Yasmine Galal Eldin Thabet***, Associate Professor of prosthodontics, Oral & Maxillofacial Prosthodontics department, Faculty of Dentistry, Ain Shams University. Her valuable advice, encouragement and patience will always be remembered.

Many more thanks are extended to all my professors, colleagues and staff members of the Removable Prosthodontic department, Faculty of Dentistry, Ain Shams University for their encouragement and help.

Many more thanks are extended to my colleague Dr ***Yasmine El-sherbiny*** for her enormous help and advice.

I would like to also thank Dr ***Ahmed El-banna*** for his endless help and valuable support.

I would like also to thank 3D vision team especially Dr ***Rami Gameel*** and many more thanks to the skillful technician Mr. ***Walid Diri*** for his kind help during the laboratory procedures in this study.

Contents

List of tables

List of figures

Introduction

Rehabilitation of edentulous patients with implant overdentures has been widely used. Overdenture treatment has been considered by a lot of authors as the first option of treatment for edentulism, providing a significant increase in the retention, stability, patient satisfaction, masticatory function as well as high survival rates of dental implants. [1-5]

Telescopic attachment is a system of double crowns in which a cylindrical form anterior crown rests on the tooth or implant to provide support for a removable crown. Telescopic attachment on natural teeth is a concept of treatment that has been successfully and widely used to support dentures since they were introduced in 1970s. [2]

The prevalent use of dental implants, lead to introduction of another form of telescopic overdenture which is implant retained overdenture. Implant retained overdentures have been used as a successful line of treatment as they increase retention, stability and chewing ability leading to increased patient comfort. This treatment modality also achieves esthetically pleasant results by using fewer numbers of implants and allows oral hygiene access. [3-5]

There are various materials that can be used to fabricate and construct telescopic implant retained overdentures. Due to high patient expectations and demands, the world of dentistry has to meet these expectations by introducing new materials to improve properties and functions. A thermoplastic material has been discovered few years ago that has already been used for human medicine and industry, namely poly-ether-ether-ketone (PEEK). [6]

PEEK offers the highest potential for a lot of prosthetic options. This material is quite a new addition to the family of prosthetic dentistry, and till now there are no similar materials

that have comparable properties. It has a lot of indications as replacement of metal frameworks and implant abutments. (7)

BioHPP (Bio High Performance Polymer) is considered a variant of PEEK that contains about 20% ceramic filler. It has been optimized especially for dental applications due to its superior properties. The addition of a special small ceramic filler results in constant homogeneity, extremely good polishing properties and high mechanical properties. (7)

The use of BioHPP as a prosthetic material gives many advantages as; preparation of light bridges with a metal-free restorations, absence of corrosion as well as similar elasticity to bone so shock-absorbing effect (off-peak property). It also has very low abrasion (within physiological range), no visco-plastic fractures, low material fatigue, low plaque affinity and high biocompatibility. Its high flexural strength and modulus of elasticity make the material unbreakable and give it consistency similar to human bone. This creates a new range of indications related to metal-free removable prosthetic restorations. (7)

Hence, this study was conducted to evaluate the effect of using different abutment materials (BioHPP, conventional titanium) on the retention of BioHPP telescopic implant-retained overdentures.

Review of literature

Edentulism:

Edentulism is the state of loss of all the natural teeth. It's considered a significant public health problem due to its high prevalence and related disabilities. Caries and periodontal diseases are considered the most important causes that lead to edentulism. [8]

It has been postulated that there is a significant association between edentulous patients with depression and poor health in younger age groups. Studies have documented the effect of edentulism on eating, speech and facial appearance that may have an impact on mental health and social activities. The relative effects may be greater when edentulism occurs at an early age. Furthermore, the thought of having to live with edentulism forever might lead to more hopelessness and depression in younger individuals. [9,10]

Over the last 20 years, the prevalence of edentulism is decreasing in high income countries. On the other hand; in low income countries, the rate of edentulism is increasing that significantly adds to the rampant burden of chronic non-communicable diseases which are now the leading causes of morbidity and mortality. [11]

It has been observed that social status is related to oral health-related quality of life and psychosocial factors are associated with onset of periodontal disease that lead to edentulism. [12]

Edentulism has a series of deleterious consequences for the patient's general health. Consequences vary from unhealthy diet, social disability and poor oral health. Edentulous patients are also in higher risk for systemic diseases that lead to higher mortality rate. [13]

Edentulism is an irreversible and debilitating condition that can be described as the final marker of disease burden for oral health. It can lead directly to functional limitation, impairment, psychosocial disability. [14,15]

After tooth loss, a continuous process of bone loss starts with a higher rate in the mandible than the maxilla. This process is called residual ridge resorption that leads to alveolar bone reduction and reduced size of denture bearing area. This reduction affects the facial height and appearance which are altered after edentulism. [16,17]

Loss of teeth leads to impaired masticatory efficiency and performance. Denture wearers have only about one- fifth to one-fourth the masticatory force and bite strength of dentate individuals. Furthermore, complete denture patients need seven times more chewing strokes than dentate ones to be able to cut food. This may explain why complete denture wearers have difficulty in chewing hard foods. [18,19]

Mandibular dentures always show higher masticatory difficulty due to smaller area of coverage, approximation to the attachments of muscles and tongue movement, which leads to denture instability. [20]

Implant overdentures:

Treatment of edentulous patients with removable complete dentures may be limited due to its detrimental effects such as inadequate retention and stability, pain, soreness and impaired masticatory efficiency. [21]

Studies that verify the influence of complete denture as a factor of bone resorption are replete; complete denture wearers attain smaller edentulous ridges than edentulous patients with no prosthesis. [22]

Implant overdenture is considered an acceptable treatment option especially for edentulous mandible because

the decreased ridge resorption may improve the retention and stability and thus patient satisfaction and quality of life. [22-24]

Studies have assumed that the survival rates were 99% for mandibular and 97.8% for maxillary implants supporting overdentures after 5 years follow-up. [25,26]

It has been recommended that mandibular overdenture retained by two implants is the minimum standard of care for the patients with edentulous mandible. However, recently, the single implant mandibular overdenture has been considered as an alternative and more feasible option for geriatric patients that achieves satisfactory primary implant stability. [27-29]

All edentulous patients are considered a perfect candidate for implant overdenture especially with atrophied ridges and elderly patients who no longer are able to wear complete dentures. The compromised retention of conventional dentures make these patients seek for a better treatment option. [30,31]

For edentulous patients, implant overdenture provides a substantial benefit from structural, psycho-social and functional points of view when compared to conventional complete dentures. In the unfavorable anatomical situation of the edentulous mandible, implant overdenture is the recommended treatment option to ensure satisfactory prosthetic rehabilitation. [32,33]

There are certain criteria that must be fulfilled by dental implants. They must be biocompatible, have optimum osseointegration and transmit functional forces within physiological limits of bone. [34,35]

A lot of patients would benefit from implant retained overdentures; especially with advanced ridge atrophy eliminating the need for total implant-supported prosthesis and when augmentation procedures are excluded. Compromised